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The Alaska National Interest Lands Conservation Act

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Section 1001 Report
Findings and Recommendations

Prepared by the Arctic District Office
Bureau of Land Management
Fairbanks, Alaska

December 1988

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Dear Reader:

The Alaska National Interest Land Conservation Act of 1980 (ANILCA) set aside more than 100 million acres of land in Alaska as national parks, preserves, wildlife refuges, and wilderness areas. Section 1001 of ANILCA required the Secretary of the Interior to study all Federal lands located north of 68 degrees north latitude and east of the western boundary of the National Petroleum Reserve-Alaska (NPR-A) that lay outside the National Park System, the National Wildlife Refuge System, or the National Wilderness Preservation System. The Secretary is required to study the oil and gas, wilderness, and wildlife values of these lands as well as make recommendations to the President and the Congress for the management of these resources. We have concluded that a 41,000-acre block along the Nigu River is suitable for wilderness designation. All other Federally managed lands in this area should be opened to environmentally sound oil and gas exploration and development.

It is important to distinguish this report from the report issued by this Department in April 1987 pursuant to section 1002 of ANILCA. That section directed this Department to conduct biological and geological studies of the coastal plain of the Arctic National Wildlife Refuge (ANWR) and to provide the Congress with the results of those studies and a recommendation on future management of that area. In our 1987 1002 report, we concluded that the 1002 area is the most promising onshore oil and gas exploration area in the United States. We recommended that the entire area be available for consideration for environmentally sound oil and gas leasing.

Unlike the 1002 area, the 1001 study area is predominantly made up of non-Federal lands. It includes within its northern zone the oil fields of Prudhoe Bay, the largest producing oil and gas field in the United States, where production is now peaking and soon expected to decline. Only about 2 million acres of the 12.8 million acre study area are unselected Federal lands. While we have concluded that a large part of that 2 million acres has high potential for oil and gas, the unexplored potential of the coastal plain of ANWR far exceeds that of this acreage. This fact, however, in no way diminishes the importance of opening the Federal lands in the 1001 area to oil and gas activities.

As this 1001 report points out, the need for new domestic development of oil and gas resources is great. Domestic oil production in the year 2000 is expected to be almost 30 percent lower than in 1987 and it is anticipated that, by the year 2000,

Celebrating the United States Constitution

Executive Summary

Introduction

This report has been prepared in response to Sec. 1001 of the Alaska National Interest Land Conservation Act of 1980 (ANILCA, P.L. 96-487). This Act directed the Secretary of the Interior to evaluate federally managed lands north of 68 degrees north latitude, east of National Petroleum Reserve-Alaska, and outside of the conservation system units established by the Act. The Secretary is directed by ANILCA to study the oil and gas, wilderness, and the wildlife values on these lands as well as make findings and recommendations for the management of these resources.

This document is the result of that study and provides 1) recommendations for the future management of oil and gas resources of the area; 2) a discussion of the anticipated transportation needs associated with the development of oil and gas resources; 3) a recommendation for wilderness designation; and 4) recommendations for the protection of study area wildlife in the event development of the oil and gas resources occurs.

The study area is approximately 12.8 million acres in size. It is bounded on the east by the Arctic National Wildlife Refuge (ANWR), on the west by the National Petroleum Reserve-Alaska (NPR-A), on the north by the Beaufort Sea, and on the south by the Gates of the Arctic National Park and Preserve. Within this large area there are approximately 3.6 million acres of federally managed land. This federal land, the specific subject of this study, consists of that portion of the Utility Corridor north of 68 degrees north latitude (1.03 million acres), and numerous scattered blocks of land outside the Corridor.

Many federal lands have been selected by the State of Alaska and/or Native corporations, but remain under BLM management until title is transferred to the selecting entity. Land use actions recommended by this report will not be implemented by BLM on selected lands without either 1) concurrence of the selecting entity [per ANILCA Section 906 (k)], or 2) invalidation of the land selection through relinquishment or other action. Federal lands within the study area are largely surrounded by lands already conveyed to the State of Alaska or to the Arctic Slope Regional Corporation. The larger study area is a complex patchwork of federal, state and native lands.

Approximately 316,000 acres of the Utility Corridor surrounding the Dalton Highway is presently covered by a BLM *Nonwilderness Assessment.* (USDOI 1980). This report accepts the present nonwilderness status of these lands.

A summary of land status and an accompanying map illustrating this status is in Section 1 of this report.

Summary of Findings and Recommendations

Oil and Gas Resources

Finding: Potential Oil and Gas Resources in the Study Area

With the exception of relatively small regions along the southern edge of the study area, the vast majority of federally managed lands fall within zones considered to have a "high" potential for oil and gas resources. This evaluation was reached by applying criteria in BLM's oil and gas occurrence potential classification system.

Finding: National Need Assessment for Oil and Gas

The study area has the potential to contribute to meeting the national need for oil and gas resources. Only exploration can provide the information needed to determine the extent and distribution of the resources and, therefore, the potential benefit to the economy.

Recommendation

Open all non-selected federal lands, with the exception of the recommended wilderness area (Nigu Block), to oil and gas exploration and development. Opening these lands will provide access to nationally needed oil and gas resources under federally managed lands. Significant discoveries within the study area could also aid in making economic the production and transportation of substantial and marginal discoveries made on lands adjacent to the study area.

It is recommended that standard summer and winter stipulations (see Appendix A) be applied to all exploration and development activities. Additional stipulations, listed below, should be followed for the protection of wildlife and wildlife habitat should development of oil and gas resources take place within the study area.

Wilderness Resources

Finding: The National Interest in Preserving the Wilderness Characteristics of Study Area Lands

After conducting a wilderness study of the 3.6 million acres of federal land, an area of the Upper Nigu River is recommended for wilderness designation. Five wilderness alternatives, ranging from no wilderness to all wilderness, were considered as part of the wilderness study. Supportive documentation for this finding is contained in both the Draft and Final Wilderness EIS for the Central Arctic Management Area.

Recommendation

The Upper Nigu Block (41,000 acres) of federally managed land adjacent to the Noatak National Preserve and the Gates of the Arctic National Park is recommended for wilderness designation.

Wildlife Resources

Findings: Impacts on Wildlife of Oil and Gas Exploration, Development, Production and Transportation

Exploration

Except for aircraft operations, all present exploration activities within the study area are conducted only during winter months (October to May). Aircraft operations during the summer months can be accomplished with minimal adverse effects to wildlife populations if appropriate mitigative measures are used.

Within the study area, winter exploratory activities can be conducted with minimal adverse effects to wildlife populations and habitats if they are properly planned, conducted under appropriate stipulations, and closely monitored to ensure compliance. In 1982, BLM conducted a caribou and waterbird impact analysis workshop to develop appropriate mitigation measures for oil and gas exploration. It was determined that winter exploratory drilling operations and activities would have little or no significant effects on caribou, if they are conducted using appropriate protective measures.

Winter exploration activities do affect the animals immediately adjacent to the drilling operations. However, the area of disturbance is generally small.

Development

While impacts associated with exploration activities for oil and gas are generally acceptable when appropriate season and location stipulations are applied to areas of crucial use, impacts associated with the development of producing fields cannot always be avoided. Impacts associated with development are generally more permanent (20 years or more) in nature than those of exploration activities (0.5 to 2 years).

Environmental contamination could occur during oil and gas development activities. Contamination would result from spills of fuel and drilling mud additives as well as from the disposal of solid waste. Operators are required to develop and implement spill and contamination prevention plans. There are many stipulations and requirements established by BLM (see Appendix A for a complete listing of standard stipulations), the Federal Environmental Protection Agency, the State of Alaska and the North Slope Borough. These stipulations are aimed at preventing undue contamination of the environment. In-place stipulations and adequate monitoring should alleviate contamination of the environment that would significantly affect the study areas wildlife and their habitat.

Finding: The National Interest in Preservation of Wildlife Resources of the Study Area

International treaty obligations

Oil and gas activities within the study area could affect waterbird populations that are used by citizens of five countries, the United States, Canada, Mexico, Japan, and the Union of Soviet Socialist Republics. The United States has treaty obligations with these countries to provide for continuation of healthy populations of waterfowl that reside temporarily within our boundaries. There is presently a great deal of concern over declining waterfowl populations worldwide and the international implications of land management decisions concerning oil and gas development within the study area cannot be ignored. In addition, the United States and Canada have an international agreement concerning the Porcupine Caribou Herd. Any management decisions concerning oil and gas activities within the study area must take the Porcupine Caribou Herd into consideration.

Threatened and Endangered Species protection needs

All federal agencies must adhere to the Endangered Species Act of 1973 as amended. It is the responsibility of each agency to promote the continued existence and enhancement of listed species within the lands they administer.

Construction of roads, material sites, airstrips, and drilling pads within nesting or foraging habitats could cause a direct loss of critical habitat for the peregrine falcon, a threatened species residing in the study area. A further, indirect loss of critical habitat for the peregrine can occur if an oil and gas field or pipeline transportation system is built immediately adjacent to nesting or foraging habitats. The long-term impact of this indirect loss of habitat could be significant in localized areas where total abandonment of nesting sites could occur. Application of protective stipulations during development activities would significantly reduce the potential for impact.

Subsistence needs

In the arctic, interest in subsistence values is very high. Under provisions of Title VIII of ANILCA, the federal government must consider subsistence users and resources in managing the public lands. Fish are a valued subsistence resource making up a significant portion of the native diet on the north slope. Therefore, precautions should be taken to preserve the fishery resources of the study area. Caribou are also highly valued as a subsistence resource and warrant similar preservation management.

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Section 3

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List of Abbreviations

ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADGGS	Alaska Division of Geological and Geophysical Survey
ADNR	Alaska Department of Natural Resources
ADOT/PF	Alaska Department of Transportation and Public Facilities
AGL	Above Ground Level
ANCSA	Alaska Native Claims Settlement Act
ANGTS	Alaska Natural Gas Transportation System
ANILCA	Alaska National Interest Lands Conservation Act
ANWR	Arctic National Wildlife Refuge
ASRC	Arctic Slope Regional Corporation
BLM	Bureau of Land Management
CAMA	Central Arctic Management Area
CFR	Code of Federal Regulations
CPF	Central Production Facility
CSU	Conservation System Unit
CZM	Coastal Zone Management
DEIS	Draft Environmental Impact Statement
DOE	Department of Energy
DOI	Department of the Interior
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EOR	Enhanced Oil Recovery
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
HMP	Habitat Management Plan
IBLA	Interior Board of Land Appeals
MFP	Management Framework Plan
MBO/D	Million Barrels of Oil/Day
MBO/Y	Million Barrels of Oil/Year
NEPA	National Environmental Policy Act
NOTAM	Notice to Airmen
NPS	National Park Service
NPR-A	National Petroleum Reserve-Alaska
NSB	North Slope Borough
NWPS	National Wilderness Preservation System
OCS	Outer Continental Shelf
ORV	Off-Road Vehicle
PLO	Public Land Order
RMP	Resource Management Plan
SMSA	Standard Metropolitan Statistical Area
TAGS	Trans Alaska Gas Pipeline System
TAPS	Trans Alaska Pipeline System
T&E	Threatened and Endangered Species
TCF	Trillion Cubic Feet
USDOI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WSA	Wilderness Study Area

Section 1
Introduction

Section 1
Introduction

Through the Alaska National Interest Lands Conservation Act (ANILCA) of 1980 (Sec. 1001), Congress directed the Secretary of the Interior to conduct an interdisciplinary study on the value of natural resources found on federal lands on the north slope of Alaska. In compliance with that Congressional mandate, a lengthy study was conducted by the Bureau of Land Management (BLM), Arctic District Office. The results of this study are reported here.

Consistent with the congressional mandate, these federal lands are examined for resource values identified by ANILCA. Specifically, this report is an interdisciplinary study of the oil and gas, wilderness, and wildlife resource values found on these lands. Transportation needs associated with oil and gas exploration and development are also discussed.

This report presents a series of findings and recommendations addressing a) the potential for oil and gas resources in the study area; b) the national need to develop these resources; c) the national interest in preserving the wilderness character and the wildlife resources of the area; and d) the effects of oil and gas exploration, development, and transportation on wildlife resources. Recommendations are made for a) the future use and management of the area's oil and gas resources and associated transportation needs in the area; b) designation of wilderness areas; and c) appropriate protection measures for wildlife and wildlife habitat in the event oil and gas resources are developed.

The report concludes with a brief discussion of the process followed by the Bureau to consult with Alaskan Native regional corporations, various federal and state government agencies, the secretaries of Energy and Transportation, and the government of Canada.

The Study Area

As defined by legislation, the federal land addressed by this report includes those lands north of 68 degrees north latitude, bounded on the east by the Arctic National Wildlife Refuge (ANWR), on the west by the National Petroleum Reserve-Alaska (NPR-A), and on the north by the Beaufort Sea. This area also includes the portion of the Utility Corridor north of 68 degrees. The federal lands within this large study area are referred to by BLM as Central Arctic Management Area (CAMA) lands.

In this report, *study area* refers to all lands (federal, state and private) within these larger boundaries. The title *Central Arctic Management Area* or CAMA is used to refer only to federal lands contained within these boundaries. The report makes this distinction for two major reasons: First, at the time ANILCA was passed in 1980, CAMA consisted of a relatively large contiguous block of federally managed land. Since that time, ownership patterns have changed through land conveyances to the State of Alaska and the Arctic Slope Regional Corporation. As a result, CAMA presently consists of the Utility Corridor and a collection of fragmented blocks of land totaling 3.6 million acres.

Second, the presence of oil and gas and other resource values on federally managed lands adjacent to the study area, or on nonfederal lands within the study area, have implications for the use and management of CAMA. Figure 1.1 provides a visual description of the entire study area and adjacent lands.

This large study area cuts across three major physiographic provinces. Each province is defined by a combination of characteristics such as elevation and vegetation. A small section of the southernmost portion of the study area is found in the Brooks Range Physiographic Province which is characterized by steep slopes, high elevations, and alpine tundra. North of this province is the Arctic Foothills Physiographic Province. The southern section of this province is characterized by a series of rolling hills exhibiting a combination of alpine and upland tussock tundra vegetation types. The southwestern portion of the Colville River and its north-south tributary system is a major feature of this subunit. The northern section of this province is dominated by upland tussock tundra with occasional incursions of wet sedge meadow vegetation types. The midsections of the Colville and Saganavirktok rivers are major features of this subunit. Finally, the northernmost portion of the study area lies in the Arctic Coastal Plain Physiographic Province. This area is characterized by wet sedge meadow plant communities. The surrounding countryside is flat, low in elevation and covered with numerous shallow lakes systems which are frozen much of the year.

Land Ownership Patterns in the Study Area

Aside from the Utility Corridor and a few isolated blocks of land still withdrawn from selection, many CAMA lands are presently under valid state and/or Native regional corporation selection. The prospect is for many of these selected lands to be transferred from federal ownership. Table 1.1 summarizes land ownership status within the study area. Figure 1.2 displays this status.

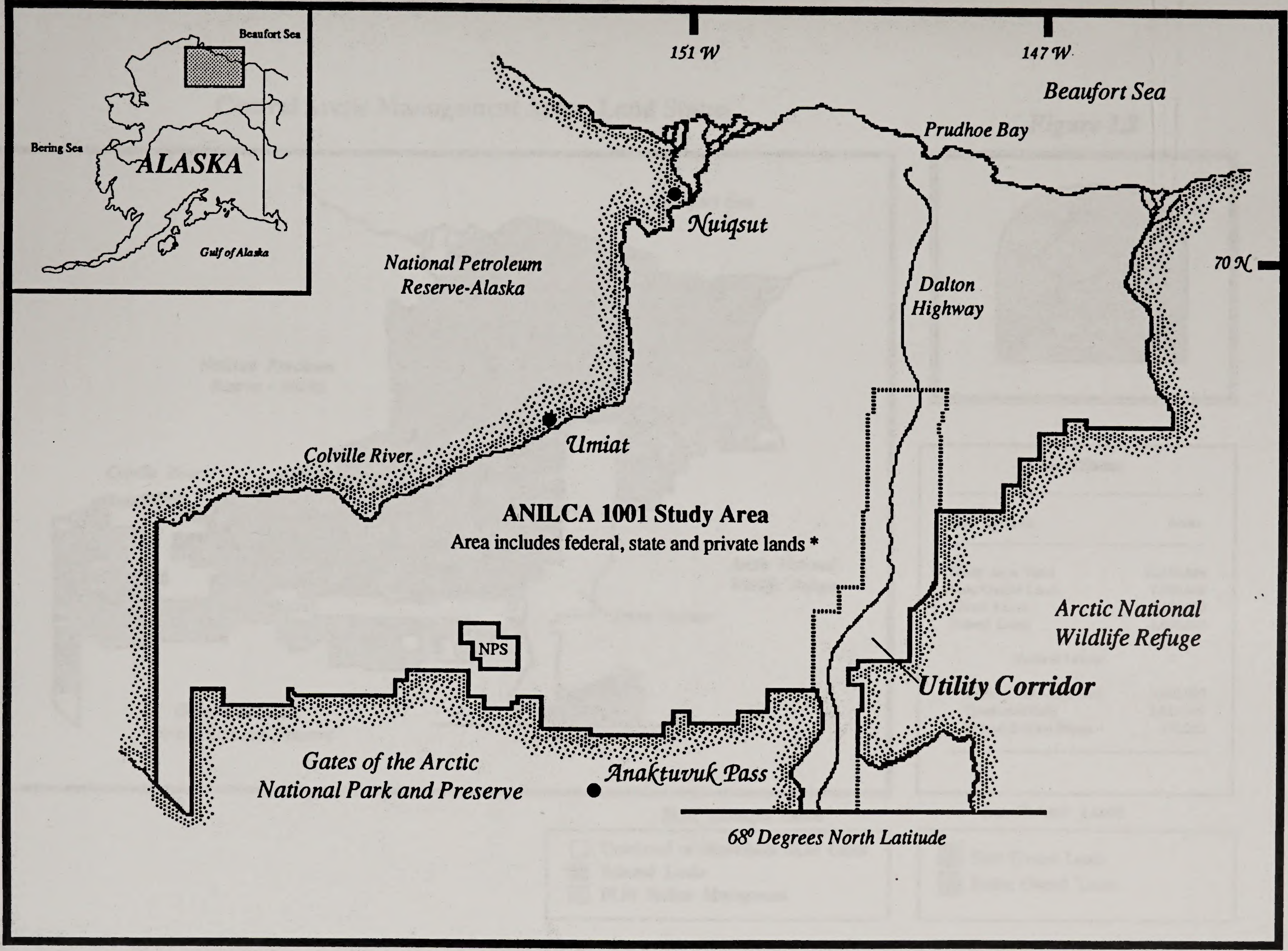
Table 1.1
Land Status in the ANILCA 1001 Study Area

Land Category	Acres
Study Area Total	**12,850,000**
State Owned Lands	7,000,000
Private Lands	2,170,000
Federal Lands (Selected and Unselected)	3,680,000
Federal Lands *	
Public Lands (Unselected federal lands)	2,052,000
Federal Surface Management Only	274,000
State Selected Lands	1,100,000
State Top-Filed Lands	400,000
Native Selected Lands	970,000
Dual Selected Lands	535,000

* These land categories overlap to some extent.

Figure 1.1

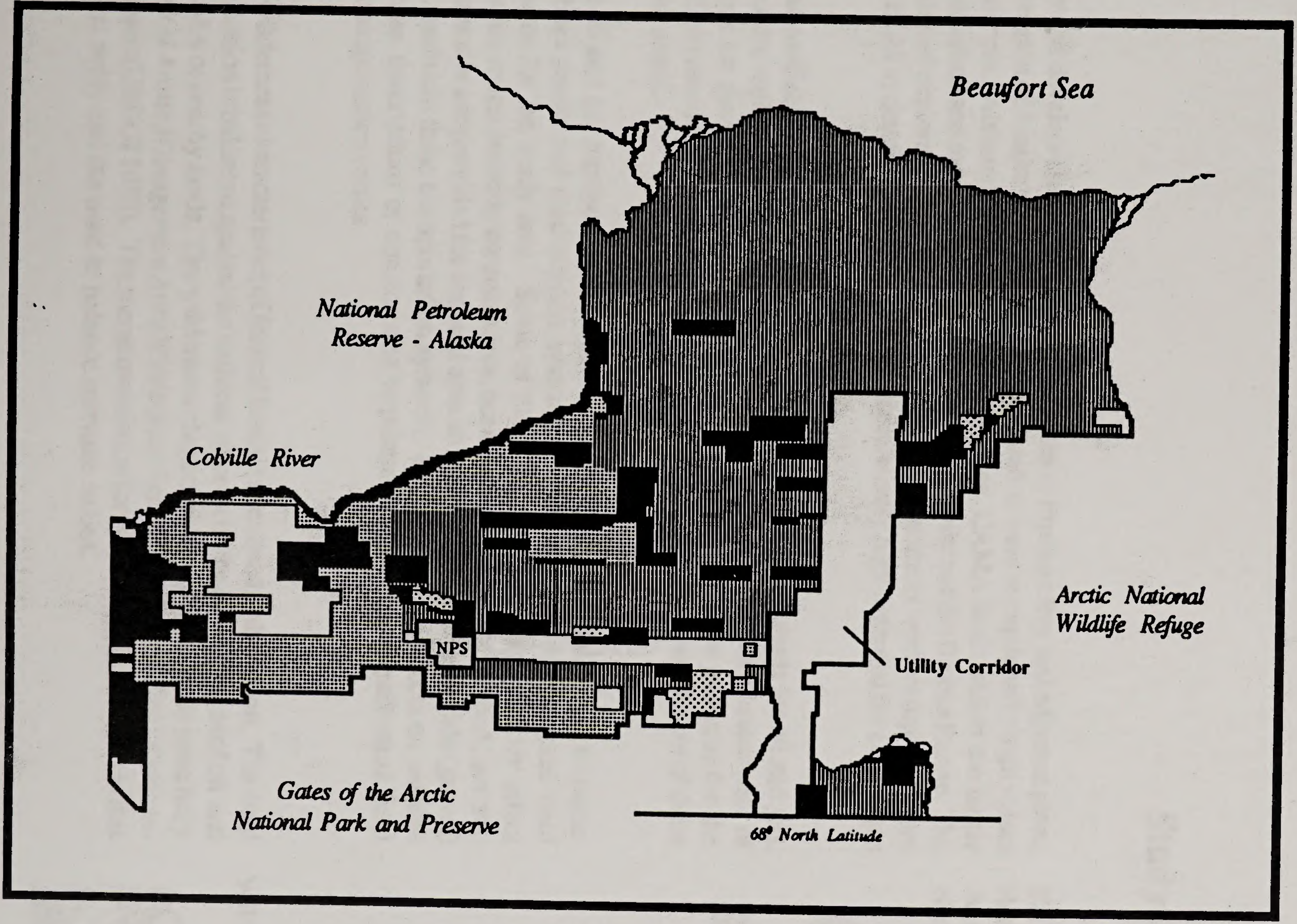
ANILCA 1001 Study Area



* See land status map for details of federal, state and private land ownership patterns.

Central Arctic Management Area: Land Status

Figure 1.2


Beaufort Sea
National Petroleum Reserve - Alaska
Colville River
NPS
Utility Corridor
Arctic National Wildlife Refuge
Gates of the Arctic National Park and Preserve
68° North Latitude

Land Status

Land Category	Acres
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Private Lands	2,170,000
Federal Lands	3,680,000
Federal Lands	
Selected and Unselected	3,680,000
Unselected Only	2,052,000
Federal Surface Mangt.	274,000

BLM Managed Lands

- ☐ Unselected or Unavailable BLM Lands
- ■ Selected Lands
- ▨ BLM Surface Management

Non-Federal Lands

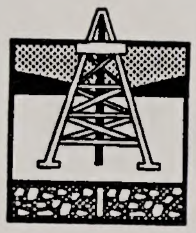
- ▥ State Owned Lands
- ▦ Native Owned Lands

The Utility Corridor Resource Management Plan

This report is based on studies and analyses, interagency/intergovernmental coordination, and public review and comment on the *Utility Corridor Draft Resource Management Plan and Environmental Impact Statement* (Utility Corridor RMP/EIS, USDOI 1987c) and the Central Arctic Management Area Wilderness Study and draft Environmental Impact Statement (CAMA Wilderness EIS, USDOI 1987c). The Utility Corridor RMP/EIS has not yet been completed. Therefore, the findings and recommendations contained herein (other than for wilderness) are subject to further review as the Utility Corridor RMP and associated EIS is completed. This report is being submitted now to ensure timely complicance with the Alaska National Interest Lands Conservation Act. In development of the final RMP/EIS, should it be determined appropriate to make substantive changes in recommendations or findings inconsistent with findings and recommendations presented in this report an amendment to this report will be prepared and submitted. The final CAMA Wilderness EIS was filed with the Environmental Protection Agency on September 30, 1988. Wilderness suitability recommendations are the Secretary's final recommendations to the President and will not be subject to further Departmental review.

Study Issues

Oil and Gas Resource Assessment and Associated Transportation Needs



With the discovery and development of oil and gas resources at Prudhoe Bay and adjacent areas, the eastern coastal region of Alaska's north slope is considered to have exceptionally high values for oil and gas resources. Although located on the north slope, CAMA lands within the larger study area lie further inland and are located within the foothills province of the Brooks Range. The area is a major focus of exploration and the exploration and assessment work completed there to date has caused BLM to classify these lands as having relatively high potential for oil and gas resources.

Although there is no available data to support a description of specific prospects for oil and gas, this report describes the regional geological characteristics and makes an overall assessment of oil and gas resources for the study area. The focus of this assessment is the potential for the discovery of oil and gas resources in the region. The national need for the development of these resources is also discussed.

Potential routes for oil and gas transportation are also described in this report. These transportation routes (pipelines routes and road support systems) are derived from hypothetical field development scenarios for the study area. Some of these hypothetical routes directly affect CAMA. Transportation routes crossing the study area, but not directly affecting CAMA, are also considered here. Estimates are provided for the land area and the construction materials (gravel) needed to build and maintain these transportation systems. Estimates of the effects on wildlife are derived from these descriptions of construction requirements for these hypothetical field developments and transportation routes.

Wilderness

A description of the wilderness characteristics of federal lands is contained in this report. The need for wilderness preservation is balanced against the national interest in the development of oil and gas resources on CAMA or nearby lands. The wilderness characteristics of these lands were fully examined in the *Central Arctic Management Area Wilderness Recommnedations Final Environmental Impact Statement* (USDOI 1988). The recommendation for wilderness designation in this report is based on that study and the need to balance resource values.

Protection of Wildlife Resources

This report also includes a general description of the terrestrial and aquatic wildlife resources of the study area. The hypothetical development scenarios for oil and gas and any associated transportation needs are used to assess the potential effects on wildlife habitat and the general disruptive effects of development activity on population and migration patterns. Of special interest are the Porcupine and Western Arctic caribou herds. A major objective of this report is to provide a set of recommendations for the protection of wildlife resources in the event that oil and gas development occurs.

Interim Management Provisions

Until Congress acts, the BLM's "Interim Management Policy and Guidelines for Lands Under Wilderness Review" (1979 as amended) serves as the principal guidance for managing federal lands in the Central Arctic Management Area (CAMA). The goal of the "Interim Management Policy" is to ensure that the wilderness qualities inherent to CAMA lands remain unchanged until such time as the study process is completed and Congress acts on the wilderness recommendation.

In addition, no BLM management action affecting CAMA lands would be implemented on land that have been selected for transfer under the Alaska Statehood Act of 1958 or under the Alaska Native Claims Settlement Act of 1971 without 1) concurrence of the selecting entity [ANILCA Sec. 906(k)], or 2) invalidation of the land selection through relinquishment or other action. No BLM action or recommendation would impede, delay, or otherwise affect the selection and conveyance of land to the State of Alaska or Alaska Natives.

Section 2
Study Area Resources

Section 2
Study Area Resources

Oil and Gas Resources

The following oil and gas resource assessment considers all lands within the study area (federal, state and private). The discussion of the petroleum geology is based on publicly available well and outcrop data from within the study area, the National Petroleum Reserve-Alaska (NPR-A) and the Arctic National Wildlife Refuge (ANWR). Public and proprietary seismic data from NPR-A and the study area, as well as publicly available papers, reports and maps relevant to the petroleum potential of the North Slope region of Alaska were also used.

The study area lands are located between NPR-A and the Arctic National Wildlife Refuge. Within the study area, although not under federal control, lies Prudhoe Bay, the largest producing oil field in the United States. Prudhoe Bay originally was estimated to contain 9.6 billion barrels of oil and 28.5 trillion cubic feet (tcf) of gas (Morgridge and Smith 1972). Since that initial discovery, a number of other areas (Figure 2.1) have been shown to contain additional economic oil and gas resources.

Petroleum Geology of the Study Area

Excluding development wells at the Prudhoe Bay and Kuparuk oil fields, over 108 exploration wells have been drilled in the study area. Due to its proprietary nature not all well data are available for use in this report. In the southern part of the study area, which is the location of most of the public lands, data from the proprietary Killik (#1), Tiglugpuk (#1), and Cobblestone (#1) wells were not available for use in this report. These wells are all on privately held Arctic Slope Regional Corporation land and mineral estates. The following description of the area's petroleum geology is derived from an integration of available well data, seismic data, and published reports of the geology of the North Slope. The geological description is a simplified overview of the complex and varying geology of the study area. A more detailed discussion of the geology and geochemistry of the study area is provided by Banet (1988).

Sedimentary Rocks

The entire study area is underlain by sedimentary rock. The thickness of the sedimentary rock can exceed 30,000 feet and range in age from Pre-Cambrian to Quaternary. The main structural features of the North Slope basin are the mostly east-west trending Barrow arch and the Colville trough (see Figure 2.2) (Carman and Hardwick 1983). Sediments increase in thickness from 2,500 feet at the arch near Point Barrow, to approximately 30,000 feet in the Colville trough to the south (Jamieson, Brockett and McIntosh 1980). On the North Slope, rocks with economic oil and gas potential are generally from Mississippian to Tertiary in age, with pre-Mississippian rocks generally considered to be the economic basement (Jamieson, Brockett, and McIntosh 1980). However, oil and gas has been recovered from the basement rocks in Alaska State F-1 and Alaska Island-1 wells on the barrier islands north of Point Thomson (Bird and Molenaar 1987).

These oil prospective rocks can be divided into two major sequences: the Ellesmerian (Mississippian to Early Cretaceous age) and the Brookian (Early Cretaceous and younger in age) (Lerand 1973). The division of these sequences is based on the source and direction of sedimentation. The

in general have low porosity, fractures are common which enhance its effective permeability. At the Lisburne field near Prudhoe Bay, porosity averages 10 percent with matrix permeability from 0.1 to 2 md (Alaska Oil and Gas Conservation Commission 1984). The Lisburne field near Prudhoe Bay produces oil and has an estimated one billion barrels of recoverable oil. It is also a major reservoir at the Prudhoe Bay field. In the foothills of the Brooks Range, at the Lisburne #1 well, oil staining was found in the thrust repeated Lisburne (Legg 1983).

Sadlerochit Group

The Sadlerochit Group unconformably overlies the Lisburne Group and is a predominantly fluvial-deltaic sequence of sandstones. These sandstones are found from NPR-A to the eastern edge of the study area. The Ivishak Formation, of the Sadlerochit Group, is the major reservoir at Prudhoe Bay. There it has porosities ranging in value from 10 to 35 percent and permeabilities in the oil producing zone of up to 4000 md (Jamieson et al 1980). The reservoir potential of this Group degrades to the south. In the central and western parts of the Brooks Range, the distal portions of the Sadlerochit Group are called the Siksikpuk Formation (Mull 1982). This Formation is mostly thin and interbedded siltstone, cherty shale and siliceous shale. Excluding fracture and/or secondary porosity, the Siksikpuk Formation has little reservoir potential (Banet 1988).

Shublik Formation

The Shublik Formation is mostly a dark gray, nodular, phosphatic, organic rich, marly limestone, and black nodular phosphatic shale with minor amounts of very fine-grained sandstone or siltstone. This formation ranges in thickness from 90 to 250 feet in wells drilled across the study area. Facies of this unit are believed to be one of the main sources for the Prudhoe oil accumulations (Siefert, Moldowan and Jones 1980). At the Kemik field, in the foothills of the Brooks Range, there is an estimated 1 tcf of gas of resources in this formation (Banet 1988).

Sag River Sandstone

The Sag River Sandstone is a fine grained quartzose sandstone. It varies in thickness from 70 feet at Prudhoe Bay to 17 feet in ANWR (Banet 1988). It is a minor reservoir for oil and gas at Prudhoe Bay. It is also a reservoir for gas at the Kavik field which is located in the foothills of the Brooks Range (Carter et al. 1977).

Kemik Sandstone

The Kemik Sandstone was deposited as long thin elongate and discontinuous sandstone bodies. The sandstones are approximately four miles by 26 miles where mapped on the surface and up to 150 feet thick (Banet 1988). They are similar to modern offshore barrier bars. These are sand bodies can be expected to be found discontinuously across the study area. The Kemik sandstone has porosities in the range of three to six percent at outcrop (Lyle et al. 1980). However, porosity values as great as 12 percent are estimated from well log data (Bird et al. 1987b). Approximately 1 tcf of gas has been successfully tested from Kemik sandstones at the Kavik field (Banet 1988).

Kuparuk Formation

The Kuparuk Formation consists of fine grained quartzose rift sequence sandstones and interbedded shales. Its aggregate thickness ranges from 75 to 200 feet with variable reservoir properties. At Kuparuk, these sands contain 4.4 billion barrels of oil (1.5 billion barrels recoverable) but they have limited lateral extent and pinch out to the south (Carmen and Hardwick 1983). This sequence is only important in the vicinity of Kuparuk field. The recent discovery at the Colville Delta

Table 2.2
Transportation Routes, Production Potential and Economic Feasibility of the Hypothetical Pipeline Routes

	Transportation Routes				
	Route 1	**Route 2**	**Route 3**	**Route 4**	**Route 5**
Oil and Gas Development					
Production potential	High potential due to the probability of economically recoverable oil from the Arctic National Wildlife Refuge (DOI 1987).	High potential due to the Coville River Delta discovery of economically recoverable oil and gas.	High potential due to existence of the Umiat discovery	High potential due to the numerous untested oil and gas traps which exist in the surrounding area.	High potential in the corridor given untested structures.
Economic Feasibility	High feasibility given discoveries in the Arctic National Wildlife Refuge or additional offshore reserves added to Point Thompson.	High feasibility since the Colville River Delta discovery proves to be economic. Feasiblity enhanced by addditional reserves found offshore or in the National Petroleum Reserve - Alaska.	Moderately feasible. Dependent on major discoveries in the National Petroleum Reserve - Alaska or on economic discoveries made in the study area.	Moderately feasible. Dependent on major discoveries in the National Petroleum Reserve - Alaska or in the study area.	Moderate feasibility. Dependent on location of commercial discovery. However, due to proximity to TAPS gas may be economic for local uses.
Material Requirements *					
Miles of Main Pipe-line/Road Construction to TAPS	55	25	85	170	20
No. of Acres Directly Affected	825	540	1043	3270	970
Gravel Needs (in cubic yards) **	4,392,000	3,192,000	5,552,000	17,114,000	5,184,000

* These requirements are for the entire length of the hypothetical pipelines, not only for federal lands affected.

** Includes main pipelines and development fields.

Route 2

This hypothetical pipeline route acknowledges the discoveries on the Colville Delta. Presently there is no publicly available data on the size of the deposit in this area. The relatively short distance (less than 30 miles) from the existing Kuparuk pipeline greatly improves the economic feasibility of this pipeline.

Route 3

Route number three suggests a corridor for transportation of oil produced in the National Petroleum Reserve-Alaska. It also reflects the possibility for development of potential discoveries in the northern half of the imbricate fold belt. The nearby Umiat field adds to the likelihood of this route since it contains 70-100 million barrels of recoverable oil. NPR-A is estimated to contain 5.9 billion barrels of oil in place and 11.3 trillion cubic feet of natural gas. There are currently 662,000 acres under lease within NPR-A.

Route 4

Route number four reflects the probable need for oil transportation from potential discoveries in the southern half of the imbricate fold and thrust belt plays within the study area as well as from NPR-A.

Route 5

Route five reflects the potential need for the transportation of fluid minerals to the Trans Alaska Pipeline from within the Utility Corridor. Proximity to TAPS would greatly reduce construction and transportation costs for discoveries in this area.

Pipeline routing and economic feasibility is largely dependent on future discoveries. Currently available estimates on the amount of recoverable oil in the area point to route number one as the pipeline most likely to occur first. Estimates for in-place ANWR oil are twice that for NPR-A. The proven reserves at Point Thompson and the announced discovery at Flaxman island add to the credibility of this route. The feasibility of route number two is largely dependent on the size of the recoverable oil discoveries in the Colville Delta region. The proximity to the Kuparuk pipeline improves the economics and likelihood of this transportation route. Routes three and four have a moderate potential for development and are largely dependent on major discoveries in NPR-A or within the study area itself. Route number five is also given a moderate potential for development with its chances enhanced by its proximity to the existing Trans Alaska Pipeline system.

Alternative Pipeline Routes

The hypothetical pipeline routes depicted are not intended to represent specific alignments. They display routings in only the most general sense. Specific alignments and alternatives to these alignments would have to await a more detailed study of route terrain, soils, and vegetative and biological resources. These alternatives will be considered as part of a detailed environmental impact statement submitted with any routing proposal before any federal rights-of-way are granted.

Each of above described pipeline routes reflect assumptions concerning the sequence or pattern of oil discovery in the region. They also reflect the known or potential oil reserves within the study area or on lands adjacent to the study area. Hypothetical alternatives to these pipeline routes could exist under different assumptions for patterns of discovery and development. For example, it is possible that if recoverable quantities of oil are discovered in the southern portion of NPR-A and within range of pipeline route number four, a pipeline constructed from NPR-A south through the Oolamnagavik block west of the Killik River connecting with pipeline route four may be feasible. Or, a pipeline from within NPR-A may connect to the Umiat field and then run south to pipeline number four, depending on the pattern of discovery in the foothills area of the Brooks Range. The development scenario and hypothetical pipeline routes described here are limited strictly to

Production Scenario

Any oil development activities located within the study area will depend on the discovery of an economic oil deposit either in the study area itself or on adjacent federal and nonfederal lands.

In the event an economic field is discovered in the study area, development and production activities would begin on a year-round basis. Proposed plans for the production and transportation facilities are developed during the economic study of the discovery and submitted to local, state, and federal agencies for approval. After completing the required review process, the plans are either approved or denied, pending further information, studies, and/or modifications. Once approved, the construction of permanent production facilities, drilling/production pads, air support facilities, roads, and pipelines would begin. The first activity would be a temporary camp to support workers who would construct the permanent pads, connecting roads, airport facilities, and a main road between a staging area and the producing field. Potential staging areas may be the Kuparuk Industrial Center or an established field in NPR-A (assuming hypothetical pipeline routes two and three are considered). Selection of the staging area depends on the location of the field, economic and environmental factors, and lease stipulations issued by government officials. Once the main road is completed, the permanent camp and production facilities are transported to the field and assembled on site. These modules are designed to last the life of the field. Depending upon the size of the field and the reservoir characteristics, the expected life of the field would be from fifteen to thirty years.

Table 2.3 summarizes the total acres disturbed and gravel required for hypothetical small and large development projects. Drilling, production pads and gravel pits used in the small-scale scenario (8,000 acres) would disturb a total of approximately 400 acres. Under the larger scenario (23,000 acres) pads would disturb a total of approximately 1,000 acres. Once the hydrocarbons are depleted from the prospect, the wells would be plugged and abandoned, the facilities would be removed, and the disturbed surface would be reclaimed in compliance with federal and state regulations.

Production Facilities

Facilities needed to produce oil and gas are the central production facilities, drilling/production wells and production manifolds, airstrips, pipelines, and roads.

Central Production Facility

The Central Production Facility (CPF) is the headquarters and primary operations center for the production activities of the field. Although one CPF is shown in the smaller scenario and two in the larger scenario, surface and subsurface conditions may require more to adequately process the oil and gas. Gravel pads needed to support housing and production modules are five feet thick and cover 40-60 surface acres. Necessary modules are built on pilings to ensure foundation integrity for the life of the project. Gravel needed for the construction of the production facility pad would probably be mined near the field.

Housing modules include sleeping and eating quarters, a food storage area, and recreation and sanitation facilities. The modules are designed to accommodate 150-300 workers. Adjoining offices house administration, engineering, communications, and other support services.

Production facilities include the equipment necessary to process the crude oil into salable oil and usable gas. This process begins by separating the production fluid into oil, gas, and water. Oil would be dehydrated and piped to TAPS through the hypothetical pipeline running to TAPS. Produced gas will most likely be dewatered and compressed for use at the production facility or reinjected into the subsurface to maintain field pressure. Presently, a gas pipeline is proposed to be built from the Prudhoe Bay field to a port facility in south central Alaska. Should this pipeline system be in place at the time of pipeline construction through the study area, some gas could be sold and transported to market. Produced water is pumped to injection wells for enhanced recovery of the oil or for disposal.

Table 2.3
Acres and Gravel Requirements for Hypothetical Prospect at Depths of 7,500 and 15,000 Feet.

Prospect Area *	Depth of Field	Facilities	Acres Disturbed	Gravel Needs**
8,000 Acres	7,500 ft.			
		Central Production Facility (1)	50	440,000
		Drilling/Production Pads (4)	40	240,000
		Airstrip and Facilities (1)	35	300,000
		Roads and Pipelines (30.3 miles)	152	1,212,000
		Gravel Pit(s) at 10' Depth	136	
		Total	413	2,192,000
23,000 Acres	15,000 ft.			
		Central Production Facility (2)	100	880,000
		Drilling/Production Pads (5)	90	240,000
		Airstrip and Facilities (1)	35	300,000
		Roads and Pipelines (90.5 miles)	450	3,620,000
		Gravel Pit(s) at 10' Depth	312	
		Total Disturbed Acreage	987	5,040,000

* Total area surrounding facilities
** In cubic yards.

Water for domestic use can be obtained from local lakes or water-filled pits (abandoned gravel source areas). Insulated tanks can store a sufficient amount of potable water for human consumption. Sewage treatment and incinerator facilities can eliminate most of the human waste and trash. Items which could not be burned would be transported to an approved disposal site.

Fuel storage would hold diesel and other refined petroleum products necessary for operating this equipment. The area would be diked to contain any spills which may occur. Electricity could be provided by a diesel powered generation plant.

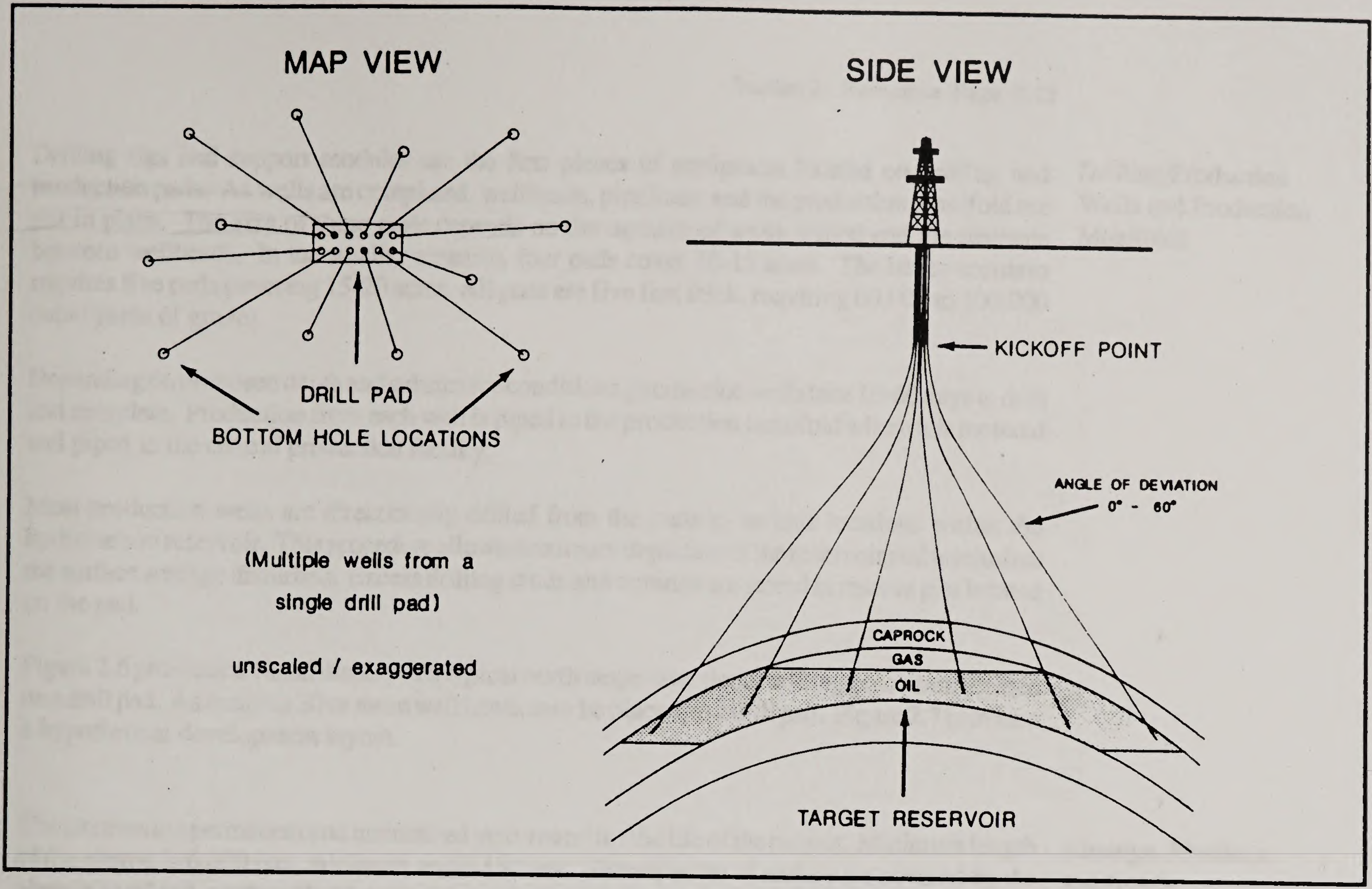


Figure 2.6 Typical North Slope Directional Drilling Procedure.

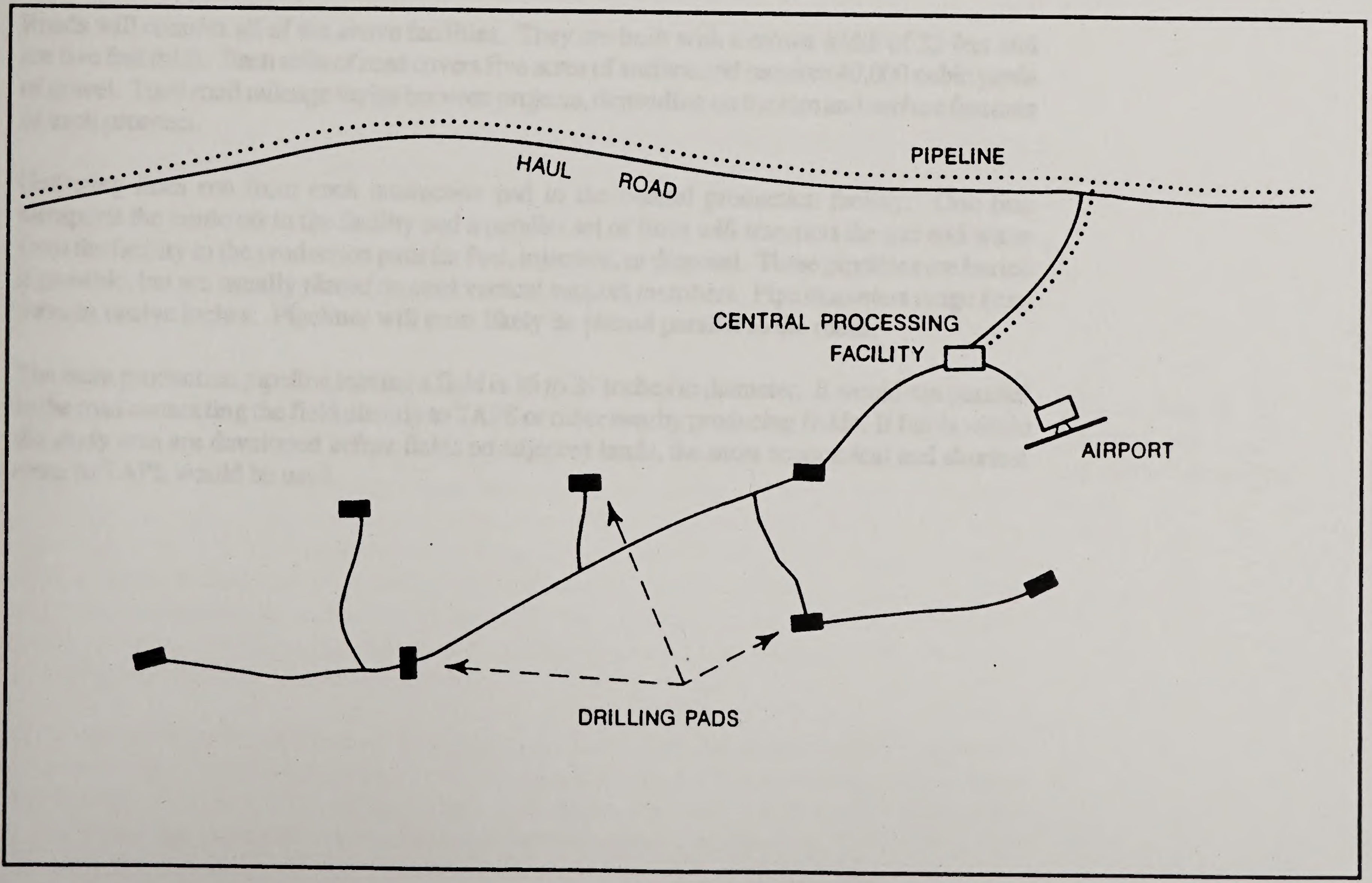


Figure 2.7 Hypothetical Development Layout.

Drilling/Production Wells and Production Manifolds

Drilling rigs and support modules are the first pieces of equipment located on drilling and production pads. As wells are completed, wellheads, pipelines, and the production manifold are put in place. The size of these pads depends on the number of wells drilled and the distance between wellheads. In the smaller scenario, four pads cover 10-15 acres. The larger scenario requires five pads covering 15-20 acres. All pads are five feet thick, requiring 60,000 to 100,000 cubic yards of gravel.

Depending on proposed depth and subsurface conditions, production wells take 10-60 days to drill and complete. Production from each well is piped to the production manifold where it is metered and piped to the central production facility.

Most production wells are directionally drilled from the pads to various locations within the hydrocarbon reservoir. This procedure allows maximum depletion of the reservoir and minimizes the surface acreage disturbed. Excess drilling muds and cuttings are stored in reserve pits located on the pad.

Figure 2.6 provides a visual display of a typical north slope directional drilling procedure located on a drill pad. As many as 30 or more well heads may be placed on a drill pad. Figure 2.7 provides a hypothetical development layout.

Airstrips, Pipelines, and Roads

The airstrips are permanent and maintained year-round for the life of the project. Minimum length of the airstrip is 6,000 feet, minimum width 150 feet. Twenty acres of surface are covered by the airstrip itself and another 10-15 acres are required for the taxiway, apron, and support facilities. Approximately 250,000 to 300,000 cubic yards of gravel are required to construct this pad.

Roads will connect all of the above facilities. They are built with a crown width of 35 feet and are five feet thick. Each mile of road covers five acres of surface and requires 40,000 cubic yards of gravel. Total road mileage varies between projects, depending on the size and surface features of each prospect.

Gathering lines run from each production pad to the central production facility. One line transports the crude oil to the facility and a parallel set of lines will transport the gas and water from the facility to the production pads for fuel, injection, or disposal. These pipelines are buried if possible, but are usually placed on steel vertical support members. Pipe diameters range from three to twelve inches. Pipelines will most likely be placed parallel to the roads.

The main production pipeline leaving a field is 16 to 24 inches in diameter. It would run parallel to the road connecting the field directly to TAPS or other nearby producing fields. If fields within the study area are developed before fields on adjacent lands, the most economical and shortest route to TAPS would be used.

Those CAMA lands in the southern mountains and foothills possess excellent to good opportunities for solitude. This is not true of the arctic plain or northern CAMA lands where distance is the most important factor in determining the opportunities for solitude.

The recommended Nigu Block in the southern portion of the study area offers outstanding opportunities for solitude. The opportunities for solitude are enhanced by its proximity to the seven million-acre Gates of the Arctic National Park wilderness and the six million-acre Noatak Preserve wilderness.

Opportunities for Primitive and Unconfined Recreation

Opportunities for primitive and unconfined recreation exist for big game hunting, fishing, sightseeing, hiking, photography, floatboating and limited horseback riding. However, the lack of adequate access over the vast wet tundra is a barrier restricting movement and activity throughout most of the lands in the central and northern portions of CAMA. The only feasible access existing in these areas is along major drainages that cross these lands. Those CAMA lands in the southern foothills and mountainous areas, although of a more rugged terrain, provide much better access opportunities than those lands to the north. Although no trails exist, other than game trails, numerous drainages and dry upland areas provide excellent opportunities for the hiker and horseback rider. Consequently these areas provide a greater opportunity for primitive and unconfined recreation than areas to the north.

In the recommended Nigu Block, outstanding opportunities are found for primitive and unconfined recreation. The presence of the Nigu River, its tributaries, and the surrounding mountainous terrain all allow for ease of movement. These features also provide the high scenic quality of the area and combine to provide outstanding wilderness recreation opportunities. These opportunities are also found in the adjacent wilderness areas managed by the Park Service.

Special Features CAMA lands contain numerous special features. Among them is the Colville River area with its important nesting sites for various birds, the most significant being the threatened arctic peregrine falcon (*Falco Peregrinus tundrus*). The Colville River itself is a unique and untrammeled arctic riverine ecosystem.

The Heritage Conservation Recreation Service study (USDOI 1978) and the Alaska National Interest Lands Conservation Act (ANILCA 1980) mandated that the Colville and the Nigu Rivers be considered for inclusion in the Wild and Scenic River System. Both Rivers were nominated because of their unique arctic riverine attributes. However, Congress did not act to include either river in the National Wild and Scenic River System. The BLM, through its draft *Utility Corridor Resource Management Plan*, has noted the special qualities within the Colville River system and has recommended that a habitat management plan be developed for the area in order to protect these qualities.

The CAMA lands, along with adjacent state and private lands, provide year-round habitat supporting caribou and moose. River drainages also provide important habitat for grizzly bears. Dall's sheep inhabit the most rugged mountainous areas in the southern portion of the study area.

Numerous archaeological sites are found on CAMA lands. However, most of these sites have not been fully evaluated for their importance. Even though CAMA lands are thought to contain many significant archaeological sites, very little of the area has been intensively inventoried.

The mountainous terrain adjacent to the Utility Corridor and the foothills fronting the Brooks Range present excellent opportunities to view unique geological formations.

CAMA offers excellent opportunities for viewing and studying arctic ecosystems. Currently, the University of Alaska operates a field research station at Toolik Lake within the Utility Corridor. Other universities with funding from research agencies have increased their research activities within the study area.

The recommended Nigu Block contains archeological sites which have not been fully inventoried. There are several sites that lie outside, but in proximity to, the Nigu Block; at least two of these may be eligible for placement on the National Register of Historic Places. All of the recommended area has been identified as possessing caribou and Dall's sheep habitat. The scenic qualities of this area are outstanding due to the undisturbed arctic tundra and adjacent mountainous terrain.

Diversity in the National Wilderness Preservation System

CAMA contains several dominant physical and biological characteristics that can be classified as regional ecosystems. The federally managed lands are split into two ecosystem types: the Arctic Tundra Province (Bailey-Kuchler number 1210, 1976) and the Brooks Range Province (Bailey-Kuchler number M1210, 1976) (see Bailey 1978). These ecosystem provinces are currently represented within the National Wilderness Preservation System (NWPS) by lands in the Noatak Preserve, Gates of the Arctic National Park, and the Arctic National Wildlife Refuge. CAMA lands located in the southern portion of the higher foothills and mountainous terrain, including the recommended area (Nigu Block), are located in the Brooks Range Province. Ecosystem representation is summarized in Table 2.3. Figure 2.9 displays presently designated wilderness areas in Alaska.

Study Area and Designated Wilderness Areas in Alaska *Figure 2.9*

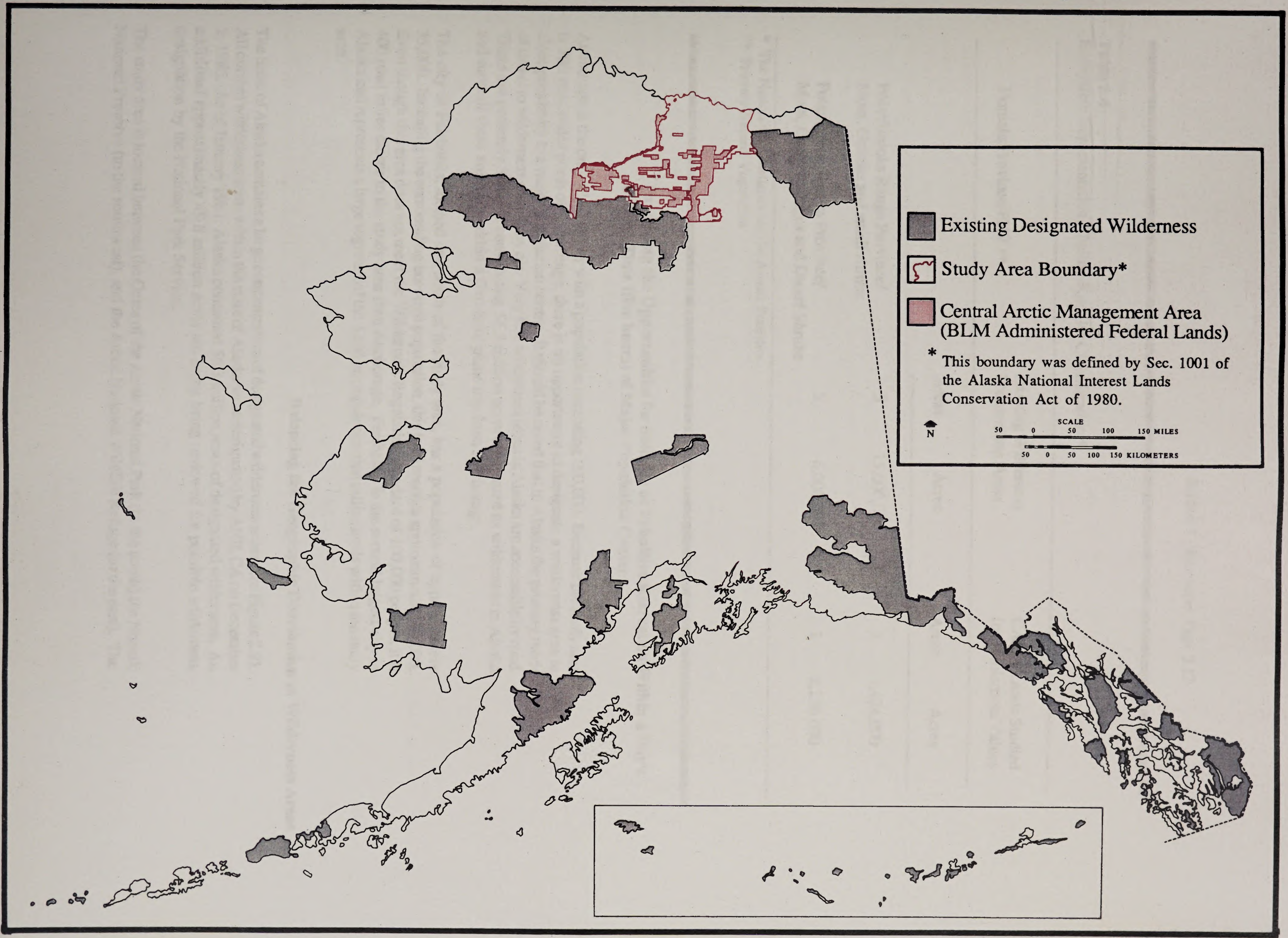

Existing Designated Wilderness
Study Area Boundary*
Central Arctic Management Area (BLM Administered Federal Lands)
* This boundary was defined by Sec. 1001 of the Alaska National Interest Lands Conservation Act of 1980.
N
SCALE
50 0 50 100 150 MILES
50 0 50 100 150 KILOMETERS

Table 2.4
Ecosystem Representation - Bailey-Kuchler Classification *

Domain/Province/PNV **	Existing Wilderness Preservation Areas		CAMA Lands Studied for Wilderness Values	
	Areas	Acres	Areas	Acres
Polar/Brooks Range Province/ Moss, Grasses and small shrubs	3	15,000,000	1	1,424,000
Polar/Arctic Tundra Province/ Moss, Grasses Sedges and Dwarf Shrubs	2	6,000,000	1	2,256,000

* The Nation-wide statistics are the Alaska Statistics
** Primary Natural Vegetation

Expanding the Opportunities for Solitude or Primitive Recreation Within a Day's Driving Time (five hours) of Major Population Centers.

Anchorage is the only Alaskan city with a population exceeding 100,000. Because the study area is 700 road miles north of Anchorage, there is no opportunity to designate a wilderness area in close proximity to a major population center. It should be noted that in Alaska the primary mode of travel to wilderness areas is by air. Very few wilderness areas in Alaska are accessable by road. There are presently 35 areas constituting 56.3 million acres designated as wilderness in Alaska and most of these areas are within a five-hour plane trip from Anchorage.

The city of Fairbanks, located due south of the study area, has a population of approximately 35,000. Including the surrounding borough population, this total reaches approximately 70,000. Even though this area does not meet the Wilderness Regulation standard of 100,000 people, it is 400 road miles closer to the study area than Anchorage. Fairbanks is the second largest city in Alaska and represents a large segment of the Alaskan population that utilize lands within the study area.

Balancing the Geographic Distribution of Wilderness Areas

The State of Alaska contains a large concentration of designated wilderness areas (see Figure 2.9). All current wilderness areas within the state of Alaska were designated by ANILCA on December 2, 1980. As of January 1981, Alaska contained 56.3 million acres of designated wilderness. An additional approximately 49.8 million acres are being being reviewed for possible wilderness designation by the National Park Service.

The study area is located between the Gates of the Arctic National Park (to the south) the Noatak National Preserve (to the southwest), and the Arctic National Wildlife Refuge (to the east). The

Gates of the Arctic National Park contains approximately seven million acres of designated wilderness; the Arctic National Wildlife Refuge contains approximately eight million acres of designated wilderness; and the Noatak National Preserve contains approximately six million acres of designated wilderness. Surrounded by these wilderness areas, CAMA lands would not necessarily contribute to balancing the geographic distribution of wilderness areas within the National Wilderness Preservation System.

Manageability

To evaluate the federally managed CAMA lands for wilderness designation, BLM must consider whether the various parcels can be effectively managed to preserve their wilderness character. Approximately 60 percent of CAMA has been selected by either the State of Alaska or the Arctic Slope Regional Corporation (ASRC). Another eight percent is under split estate management; BLM manages the surface and the regional corporation owns the subsurface (see Table 1.1). Other federal lands have been set aside or identified for transportation and utility purposes, such as lands withdrawn by PLO 5150 or lands identified by Section 1431(j) of ANILCA. Because of their size, configuration, location, and selection status not all of CAMA can be managed over the long-term to maintain wilderness values.

The Nigu Block can reasonably be managed as wilderness to preserve wilderness values. The oil and gas potential for this block of land is rated low and the land is unleased. The locatable mineral potential is rated moderate, but no claims exist. The area is currently withdrawn from mineral entry and selection. Further, management of this area as wilderness would be enhanced because it is bordered on three sides by existing designated wilderness areas.

Energy and Mineral Resource Values

While the majority of CAMA (approximately three million acres) is estimated to have high potential for oil and gas occurrence, it is rated as having low potential for locatable minerals occurence. Only a small fraction of CAMA (approximately 350,000 acres) is rated as having moderate potential for locatable minerals. Although there are a small number of mining claims on federal lands, there has been no locatable mineral production.

The recommended Nigu Block lies within an area rated low for oil and gas occurence and moderate for locatable mineral potential occurence.

Local Social and Economic Considerations

Wilderness designation of the recommended Nigu Block would not significantly change the social conditions of local villages, or the North Slope Borough at large. Local subsistence activities would not be curtailed by a wilderness designation in the Nigu block because the area would be managed to allow winter surface travel by snow machine for subsistence hunting purposes.

With increases in exploration on nondesignatied lands additional employment could potentially reach 50 to 60 workers in a 3 year exploration phase. A development phase is possible, but is highly dependent on the price of oil and the quantities discovered. A development phase for one field and construction phase for one pipeline could employ between 1,500 to 2,000 workers for a period of 4 to 8 years. On-line operation could require 150 - 300 workers for 8 to 30 years.

Most of this employment would not directly affect local rural residents. In 1982 for example, a special census conducted by the Alaska Department of Labor found only 178 resident workers (native and non-native) out of 6,306 oil industry workers (Minerals Management Service, 1986). If this proportion of resident to nonresident hire holds for future development, it is anticipated that only 2.8% of new employment, or 65 to 88 jobs created under a development scenario would accrue to local rural resident workers.

The reasons for limited rural resident involvement in the oil related work force are:

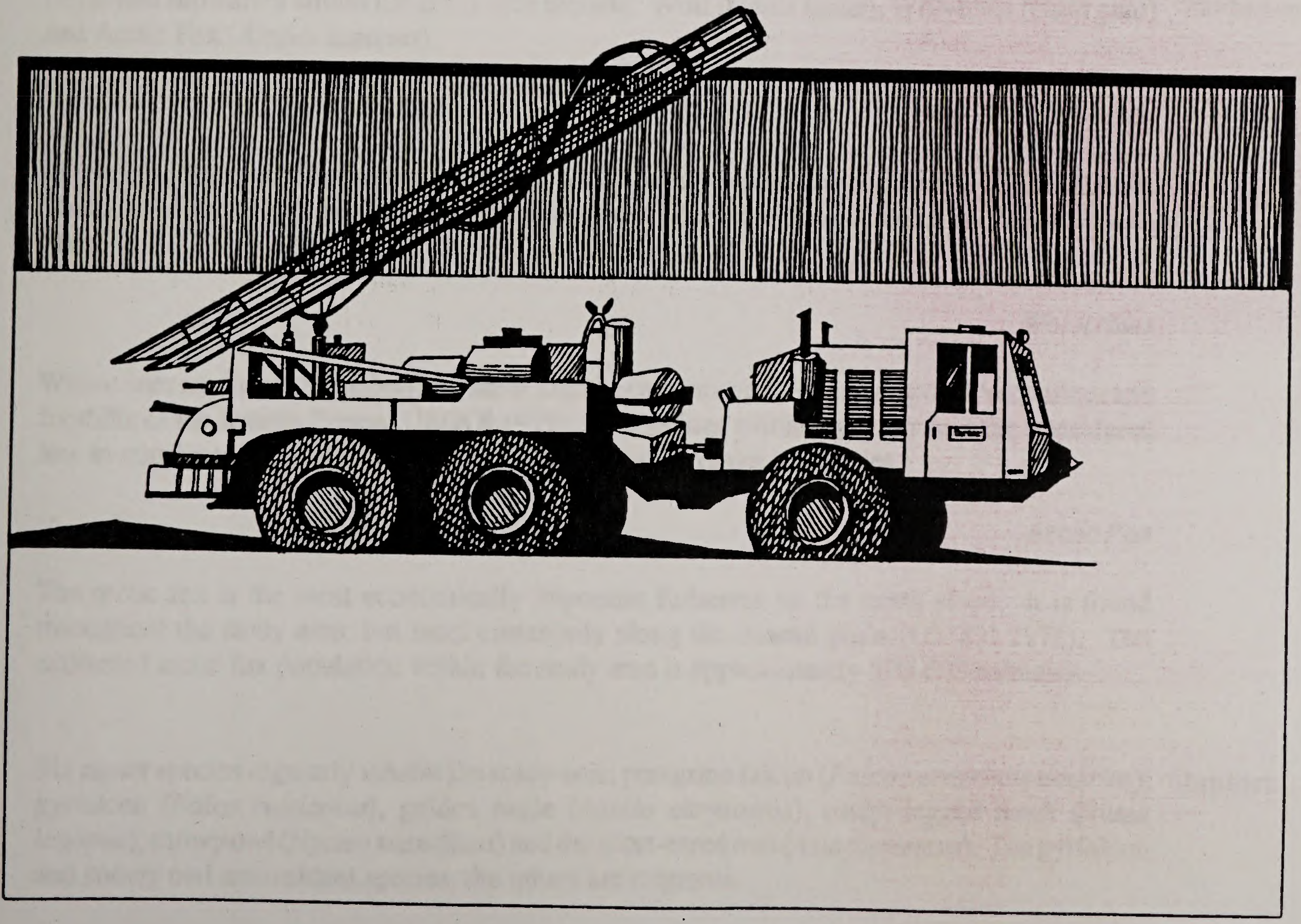
1. Current oil production activities call for proportionally more specialized labor.

2. Much of the labor demand is met by unions with hiring halls in Fairbanks and Anchorage.

3. The number of people required is large enough to guarantee that rural resident workers will be a small minority of the labor force.

4. Existing work schedules provide for time off, but only according to a rigid pattern that does not fit well with Inupiat desires to mix wage employment with hunting, fishing, and village social activities (Kruse 1984). It is anticipated that employment opportunities within the villages will decline, making oil industry employment more important. At the same time, nonresident competition for oil related jobs will also increase.

The largest economic impact of oil development would be on State and North Slope Borough revenues from revenue sharing of royalty payments, severance taxes, and property taxes. The amount of public revenue generated would depend on the price of oil and the amount of economically recoverable reserves. Additional development in CAMA would mean a continuing growth trend in these local revenue sources.



occur south of that line (Jakimchuk 1974). In winter the largest concentrations of moose occur along the Colville River and its north-flowing tributaries, including the Chandler, Anaktuvuk, Tuluga, Nanushuk, Itkillik, Killik, and Oolamnagavik rivers (Coady 1979). These rivers support riparian habitats that are crucial foraging areas for moose during the winter months. The estimated moose population within the Colville drainage is approximately 1,500 animals.

Muskoxen

Muskoxen (*Ovibos moschatus*) were reintroduced to the Alaskan Arctic Slope in 1969 when 52 animals were released at Barter Island. In 1970, 13 more animals were released on the Kavik River and 36 at Cape Thompson (USDOI 1978). The muskox have established themselves on the north slope east of the Kavik and Canning Rivers, along the Arctic Coastal Plain. In recent years, small groups and individual animals have been observed along the Sagavanirktok River.

Grizzly Bear

Grizzly bears (*Ursus arctos*) are found throughout the study area, but are generally associated with the river valleys and foothills of the Brooks Range (Crook 1972). The bears extensively use river valleys for foraging during spring, summer, and fall (Reynolds 1979). The study area grizzly bear population has not been determined, although one study (addressing a region west of the study area within NPR-A) estimated the density at one bear per 110 miles squared (Crook 1972).

Polar Bears

Polar bears (*Ursus maritimus*) seasonally inhabit onshore areas, generally within 20 miles of the Arctic Ocean. The Colville River delta area contains suitable habitat for denning, although no den sites have been documented in recent years. Polar bears den in snowdrift areas along river cutbanks, and do not use the same site from year to year.

Furbearers

Important furbearers within the study area include: Wolf (*Canis lupus*), Wolverine (*Gula gula*) and Arctic Fox (*Alopex lagopus*).

Wolves

The wolf is distributed throughout the Arctic Slope, with an estimated population of 400 animals. The population is the highest in the foothills and mountains and lowest along the Arctic Coastal Plain.

Wolverines

Wolverines are found throughout the study area, but are more common along the river valleys and foothills of the Brooks Range (USDOI 1978). Wolverines within the study area are considered low in numbers, except along the Colville River and its major tributaries.

Arctic Fox

The arctic fox is the most economically important furbearer on the north slope. It is found throughout the study area, but most commonly along the coastal plain (USDOI 1978). The estimated arctic fox population within the study area is approximately 500-600 animals).

Raptors

Six raptor species regularly inhabit the study area: peregrine falcon (*Falco peregrinus tundrius*), gyrfalcon (*Falco rusticolus*), golden eagle (*Aquila chrysaetos*), rough-legged hawk (*Buteo lagopus*), snowy owl (*Nyctea scandiaca*) and the short-eared owl (*Asio flammeus*). The gyrfalcon and snowy owl are resident species, the others are migrants.

Whitefish/Cisco

Whitefish, including arctic cisco, least cisco, broad whitefish, humpback whitefish and round whitefish, are believed to be the most abundant fish inhabiting the north slope. They are also the most important in terms of demand by subsistence and commercial fisherman in the Arctic. In the aquatic food web they are important to larger predatory fish such as burbot and arctic char. Whitefish usually feed on aquatic macroinvertebrates (e.g., mosquito larvae).

The life histories of the five whitefish species inhabiting the study area vary, but there are some generalities. In the Arctic, whitefish mature at about age five and spawn in the summer or fall. Fall eggs overwinter before hatching in spring. Whitefish rarely live more than 10 to 12 years. Most prefer stream or riverine habitat, but the least cisco is also common in lakes. Arctic cisco are abundant in the Colville River drainage, but are thought to spawn outside the study area in the Mackenzie River drainage of Canada (Burr, personal communication 1987).

Figure 2.14 accompanying this report illustrates rivers and streams known to be important to anadromous fish species. Resident (nonanadromous) species habitat is not shown. Generally, these species inhabit the same waters as anadromous species. An exception to this is a resident species transferred to a water inaccessible to anadromous species. Another exception would be an anadromous species cut off from habitat by natural or man-caused barriers, or certain waters with habitat features unsuitable for anadromous species, but acceptable to a less sensitive resident species (suitable spawning gravels, food supply, water quality, etc.).

In most cases the upstream limit on a particular stream designates the limit of inventory, not the limit of fishery habitat (ADF&G 1986). There is a general lack of fishery information for the north slope and the study area is no exception, particularly the western half (Burr, personal communication 1987). Therefore, not all streams important to anadromous fish have been identified. Although all unidentified streams are not necessarily important anadromous waters, it is prudent to assume that all streams not yet inventoried are inhabited, at least seasonally, by anadromous species.

Lake habitat is very important to anadromous and resident species, particularly for overwintering (USDOI 1987b). However, very little is known of the specifics of this habitat in the Arctic. Although some analysis of species occurrence has been done in lakes having reasonable access, this analysis was of limited scope and not all species present were sampled. Therefore, no lake habitat is identified on the map found in this report. However, it should be assumed that all lakes of sufficient depth are important fishery habitat until fisheries inventories have proven otherwise.

Section 3
Study Findings

Section 3
Study Findings

Introduction

This section of the report presents the study findings required by ANILCA Sections 1001(c)(1-5). These findings report on the oil and gas potential in the study area, the national need for the development of domestic oil and gas resources, the national interest in preserving the wilderness characteristics of these lands, the impact on wildlife resources of oil and gas development, and the national interest in protecting wildlife resources. Each finding is preceded by a discussion of background and rationale for the finding.

Findings: Oil and Gas Resources

Estimated Oil and Gas Resources in the Study Area

The study area is located between NPR-A (with 558,946 acres under lease as of September 1, 1988) and the ANILCA 1002 area (ANWR), which is judged to be the most outstanding onshore petroleum exploration target in the United States (USDOI 1987a). All current oil and gas production in the study area is from the area's northern quadrant. As shown on the land status map in Section 1, nearly all federally managed land addressed by this study is in the southern half of the study area.

The Prudhoe Bay and the Kuparuk River fields, the two largest producing oil fields in the United States, lie on state lands within the northern quadrant of the study area. At the time of discovery in 1968, Prudhoe Bay was estimated to contain 9.6 billion barrels of commercially recoverable oil and 28.5 trillion cubic feet of gas. Production through 1987 was 5.5 billion barrels. Two other fields in this area are also currently producing oil — the Lisburne and Endicott fields. These four fields, with a total production of almost 2 million barrels per day (MBD) as of April 1988, feed the Trans Alaska pipeline system (TAPS) which bisects the study area and brings the oil to tidewater at Valdez, Alaska. These fields currently provide almost 25 percent of the nation's oil production. Additional onshore and offshore oil fields have been discovered in the northern area and are being delineated. Other fields are likely to be discovered. Further, it is estimated that between 26 to 44 billion barrels of in-place heavy oil and tar deposits lie near Prudhoe Bay in the West Sak and Ugnu deposits (Werner 1984).

Although all the producing fields are located in the northern quarter of the study area, industry interest first focused in the southern half with wells located over surface anticlines (Bird 1981). No commercial discoveries were made, but oil and gas were encountered in the majority of the wells. Although there have been no commercial discoveries as yet in the southern half of the study area, the Kavik, Kemik, Gubik and East Umiat gas fields have been identified, along with numerous oil and gas shows. Only 32 wells have been drilled in the central and southern portion of the study area. Four of these (Lisburne #1, Killik #1, Tigkukpuk #1, Cobblestone #1) were drilled since 1975. With the exception of Lisburne #1, all the results from these four wells are held confidential.

Since most of the previous wells were drilled on surface features, the central and southern portions of the study area are largely untested. Since 1975, there has been an increasing awareness of the complexity of anticlines associated with geological structures known as foreland fold and thrust belts. These systems of thrust faults are increasingly recognized as important unexplored locations of hydrocarbon resources (Mitra 1986). This new exploration technique was successful in finding the giant Waterton field in Canada and fields in the overthrust belt in the Rockies. These were uncertain techniques given the quality of the seismic data available before 1975. However, improved seismic techniques and a better understanding of geological structures suggest that a very large number of potential traps in the study area remain untested.

This report finds both the northern quarter and the southern half of the study area to have high potential for the occurrence of oil and gas with a certainty rating of "D" (abundant direct and indirect evidence) (BLM classification, see Appendix B). The middle quarter of the area is estimated to have a high potential with a certainty rating of "C" (direct evidence). To date there have been three exploratory wells drilled in this middle area and ARCO completed drilling a well 25 miles south of Prudhoe Bay in March of 1988.

The National Need for Oil and Gas Resources and the Study Area's Potential Contribution

Section 1001(c)(3) of ANILCA requires an evaluation of the relationship of the hydrocarbon resources on the federal lands in the study area to the national need for additional domestic sources of oil and gas. Benefits which could accrue to the nation from the development of oil resources in the study area, depending on their magnitude, include increased domestic oil production, reduced oil imports, gains in national income, reduced vulnerability to disruptions in the world market, and improvements in the balance of payments and national security. The following analysis focuses on oil because natural gas from the study area may not become economic to produce and transport to market in this century since there is presently no pipeline to carry the gas through Canada or to the south coast of Alaska for tanker transportation.

If leasing in the study area is authorized and economically producible oil is discovered, 5 to 10 years would be required to delineate fields, prepare development plans and environmental analyses, secure regulatory approval, drill the first group of wells, and design and construct the required production and transportation infrastructure.

In assessing the national need for oil and gas resources this report will rely primarily on the most recent authoritative forecast, the Energy Information Administration's (ETA) *Annual Energy Outlook for 1987* (USDOE 1988) and on other governmental and private estimates published in late 1987 and in 1988 (USDOE 1987c, Congress/OTA 1987, Chevron 1987, Riva 1988, Woods 1987a and b, IPAA 1988, Fisher 1985 and 1987, NPC 1987). The recent reports are based on current conditions and expectations. They assess the probable effects of the worldwide crude oil price collapse in the first half of 1986 and the major restructuring of the oil and gas industry which followed. The recent forecasts differ markedly from those made before the collapse in oil prices. The methods, assumptions, and time periods considered in the reports reviewed vary, but they reach similar conclusions regarding the nation's future energy supply. The magnitude and the timing of future oil production, consumption, and imports are exceptionally difficult to predict since they will be influenced by a range of interrelated factors. These factors include the worldwide price of oil, oil discovered in the U.S. and the free world, international economic and political conditions, the rate of real growth in the nation's economy, and the policy of the Organization of Petroleum Exporting Countries (OPEC). The estimates assume continued U.S. and international economic stability.

The 1988 Annual Energy Outlook forecasts for the nation's production, consumption, and importation of oil to the year 2000 are summarized in Table 3.1. This table includes statistics for 1987, base case estimates for the year 2000, and the anticipated relative changes in the major sources of U.S. oil supply between 1987 and 2000. The forecast estimates that domestic crude oil production in the year 2000 will be about 6 MBD, almost 30 percent lower than in 1987. Other recent estimates are as low as 4 MBD in 2000 (NPC 1987, Spaulding 1986, Doscher and Kostura 1986, Kuuskraa 1986)

Table 3.1
Petroleum Imports, Production, Consumption in Millions of Barrels with World Oil Prices for 1987 and Base Case Forecasts for the Year 2000.

	1987 Actual	2000 Base Case Forecast	Percent Change 1987 to 2000
Production			
Crude Oil	8.3	6.0	- 28%
Other Liquids *	2.3	2.4	+ 4%
Total	10.6	8.4	- 21%
Consumption	16.5	18.3	+ 11%
Net Imports **	5.8	10.0	+ 70%
World Oil Price ***	$18.10	$30.80	+ 70%
Percent: Imports of Production	35%	55%	

* Includes natural gas liquids, processing gain, and other domestic production.
** Due to rounding, consumption less production may not exactly equal net imports.
*** In 1987 dollars.

The 1988 Annual Energy Outlook and other data suggest the following major trends which demonstrate the national need for increased domestic oil and gas production.

- Domestic crude oil and natural gas production will continue to decline.
- Imports, the primary non-domestic source of supply, will increase steadily since consumption will moderately increase.
- A major and increasing portion of consumption will be met by imports.
- The worldwide price of oil will significantly increase, particularly after 1995.
- Greater imports at higher prices will rapidly increase the cost of oil to the U.S. and add to the trade deficit.

limited to growth in demand (Fisher 1987, Woods 1987a and b). Authorities however, predict that oil prices will not return to 1985 levels until late in this century (USDOE 1988, Woods 1987a, Chevron 1987 and others).

No detailed recent EIA estimates of oil supply after 2000 are available. However, to approximate production in subsequent years the EIA in a separate service report focusing on the Arctic National Wildlife Refuge (ANWR), assumed that U.S. production after the year 2000 will continue to decline at about 2.2 percent per year to 4.0 MBD in the year 2015 (USDOE 1987c). The EIA estimates in the 1988 Annual Energy Outlook and the ANWR report are based on different methodologies but reach similar conclusions: The production downturn will continue into the next century. The EIA estimates and those prepared by other authorities do not include oil that might be produced in the ANWR area, the Section 1001 area, or on other unleased federal lands.

Reserves

Fields having recoverable reserves exceeding 100 million barrels of oil (MMB) are described as national class giants, fields having reserves exceeding 500 MMB as supergiants or world class giants. There are few giants and supergiants but they constitute the bulk of the world's oil production. Fewer than 300 supergiant oil fields (out of 40,000 oil fields worldwide) contain more than 80 percent of the world's known oil reserves. More than 40 supergiants have been discovered in the United States, almost all prior to 1939.

Only 13 domestic fields having total reserves greater than 1 billion barrels have been discovered. Their original reserves, remaining reserves, current production rate, and year of discovery are presented in Table 3.3.

Significantly, only two supergiants have been discovered in the United States in the last 36 years: Prudhoe Bay (1968) and Kuparuk River (1969), both in Alaska. Discovery patterns for giant oil fields are only slightly more favorable. Three have been discovered in the past 36 years: McArthur River (1965) in Alaska, Jay (1970) in Florida, and East Anschutz (1981) in Wyoming. Only the giant field of East Anschutz has been discovered since 1970. About two-thirds of the 270 giants were found before 1940, but only 94 since. The number of such discoveries decrease in each successive decade. Frontier areas such as northern Alaska and the deep water OCS have geologically the greatest potential for giant and supergiant discoveries.

The major fields which have been discovered in or near the study area and their original producible oil reserves and potentially producible gas reserves as listed in Table 3.4.

Proved Reserves

Proved domestic crude oil reserves have been reported annually by the EIA since 1976. This statistical record demonstrates that:

- Reserves decreased by over 24 percent from 1976 to the end of 1987 and by almost six percent in 1987 to 25.4 billion barrels.
- If crude oil reserves could be produced as rapidly as needed, the nation's reserves would supply 1987 consumption for 4.2 years and equal 1987 production for 8.4 years.
- Annual production has exceeded reserves during 16 of the past 17 years. The balance since 1976 is about 33 billion barrels produced and 25 billion barrels of reserves added, a deficit of 8 billion barrels.

Table 3.3
U.S. Oil Fields with Ultimate Recovery Exceeding One Billion Barrels of Oil

Field	Year Discovered	Original Reserves *	Remaining Reserves *	Current Production **
Prudhoe Bay, AK	1968	9.60	5.10	568
East Texas	1930	6.00	1.11	48
Wilmington, CA	1932	2.55	.36	41
Midway-Sunset, CA	1894	2.16	.45	54
Kern River, CA	1899	1.99	.92	51
Yates, TX	1926	1.95	.90	45
Wasson, TX	1936	1.68	.57	33
Kuparuk River, AK	1969	1.49	1.30	79
Elk Hills, CA	1911	1.47	.70	47
Panhandle, TX	1921	1.46	.07	11
Kelly-Snyder, TX	1948	1.35	.15	19
Huntington Beach, CA	1920	1.12	.07	8
Slaughter, TX	1936	1.03	.06	24

* billion barrels of oil; ** million barrels of oil per year.
Source: Oil and Gas Journal 1986 and Roadifer 1986

Table 3.4
Summary of Oil and Gas Discoveries and Estimated Recoverable Reserves in or near the Study Area.

Discovery	Discovery Date	Original Oil Reserves *	Original Gas Reserves **
Prudhoe Bay	1968	9600	29
Lisburne	1968	210	0.5
Kuparuk	1968	1492	6
Milne Point	1969	***	
Gwyder Bay	1969	80	
Point Thomson	1977	?	5
Endicott	1978	375	7
Seal island	1984	?	
Colville Delta	1985	?	

* In millions of barrels
** In trillion cubic feet
*** Included with Kuparuk
Source: Alaska Oil and Gas Conservation Commission

- Over 60 percent of new reserves resulted from revisions and adjustments, largely from development activities in old fields and recalculations while less than 40 percent were added by exploration drilling and only six percent by new field wildcatting.

- Discoveries of new fields and additional discoveries in old fields replaced 18 percent of the oil produced in 1986 and 30 percent of the oil produced in the last 10 years.

On the basis of current low drilling rates, Riva (1984, 1986, and 1987) predicts a decline from the 1985 reserve figure of 28.4 MBO to 25.1 MBO in 1990 and to 21.7 MBO in the year 2000. The most significant declines in reserves will occur in the older, traditional oil-producing areas of the western United States, Texas, the Gulf Coast, and the mid-continent. In the frontier regions of Alaska and offshore California, prospects for substantial reserve additions are possible only if extensive exploration activities are authorized on federal lands.

Potential Domestic Oil Production and Reserves

Production capability and reserves can be increased by 1) exploring for new fields, 2) extending or finding new reservoirs in known fields, 3) producing more of the total oil-in-place by enhanced oil recovery (EOR) methods, in-fill drilling, well stimulation, etc., and 4) developing improved production technology. Use of each technique depends on projected prices of oil and gas, economics, and the relative costs of the techniques.

The data previously summarized demonstrate the accelerating trend of declining domestic oil production and reserves. If current production and reserves in known fields are assumed (the reserves/production ratio), the nation's oil reserves would theoretically be exhausted in eight years. But because oil field production conventionally declines about 10 percent per year compounded, in practice it will take about 30 years to exhaust known reserves.

Oil Imports

Since the early 1970s, when domestic production capability was no longer able to satisfy demand, this nation has depended heavily on foreign petroleum. Table 3.5 is a summary of the trend years in the level of imports of crude oil and refined products.

Table 3.5
Summary of the Trend Years in the Level of Crude and Petroleum Product Imports.

Year	Imports (MMBD)	Percent of Domestic Supply *	
1970	3.42	23	
1977	8.81	47	(Peak to Date)
1985	5.07	32	
1986	6.22	38	
1987	6.55	40	

* Refers to domestic supply of crude oil only. If "supply" considered other domestically produced liquids such as natural gas liquids and processing gains, the percentage would be slightly lower for all years (e.g. 1987 would be 35 percent rather than 40 percent).

The DOE's EIA 1987 base case forecast, summarized in Table 3.1, predicts that imports will increase to 10.8 MBD, almost 60 percent of demand by the year 2000. These trends will continue into the next century in the opinion of the authorities previously cited. Most predict a higher level of imports in 2000 than does the EIA.

The nation's oil imports come from two general sources; members of the Organization of Petroleum Exporting Countries (OPEC), such as Saudi Arabia, Venezuela, and Indonesia; and non-OPEC oil producing nations, such as Mexico, Canada, and the United Kingdom.

From 1977 to 1985 the sources of U.S. imports changed dramatically as non-OPEC production was stimulated by the prevailing higher oil prices. Imports from the Middle East declined from 2.5 to 0.2 MBD while imports from the Western Hemisphere and Western Europe increased from 1.0 to over 2.0 MBD. This market loss by the Persian Gulf members of OPEC (OPEC-PG) was a major factor in the 1986 price collapse. Since early 1986, as U.S. imports increased, imports from the Middle East have rebounded sharply. Authorities agree that the non-OPEC producers, the major source of U.S. imports at this time, will be unable to maintain their production and export level past 1995 as their reserves are depleted and are not replaced by new discoveries. This follows since the OPEC-PG nations, who essentially control international oil prices, will maintain a price level too low to strongly encourage U.S. and non-OPEC exploration and production. OPEC-PG currently has the oil producing capacity to underprice all but a minor amount of U.S. and non-OPEC production. This competitive advantage will increase since only the OPEC-PG nations have the oil production, reserves, and resource capacity required to sustain the current international production level to the end of the century. About 80 percent of OPEC's potential capacity at the price levels which OPEC-PG can dictate, is located in the Middle East. Almost two-thirds of the free world's oil reserves are located in this area in five countries: Saudi Arabia, Kuwait, Iran, Iraq, and the United Arab Emirates. Further, more than two-thirds of the free world's unused production capacity lies in these nations. OPEC, therefore, has the capability to control the world oil market well into the next century. Time is clearly in OPEC's favor (Riva 1988, McCaslin 1988, Chevron 1987). OPEC's history demonstrates it is likely that the internal dynamics among the members will be consistently unstable.

In summary, as oil production and reserves in the U.S. and the non-OPEC countries decrease, it is probable that this nation will become significantly more dependent on imports from the oil rich OPEC-PG world no later than the mid-1990s. If this occurs, oil prices will increase as supply competition decreases and the OPEC nations will regain market leverage and control of the international oil market.

National Security and Economic Security

The potential contribution from study area production goes well beyond providing a percentage of U.S. domestic oil needs that might otherwise have to be obtained from foreign sources of supply. Production of oil from the study area can help achieve national economic and security objectives as well. Key elements in this potential contribution are briefly presented in this section.

Growing reliance on imports, particularly from suppliers in the Persian Gulf, for a substantial part of U.S. oil consumption creates many national security problems. The risk of major supply disruptions limits the response flexibility of U.S. foreign and national security policies in reaching peaceful resolution of disputes. The United States could be drawn into potentially dangerous political and military situations involving exporting nations. Dependence on oil imports entails dependence on extended supply lines which adds to our defense burden. Key weapon systems in the Nation's arsenal, and systems under development, use hydrocarbon fuels. Military consumption would sharply increase in emergency situations. Clearly, the most secure sources of supply for such fuels are domestic production.

Secure oil supply has a direct bearing on the achievement of national economic goals that depend on uninterrupted economic activity. Disruption of supply, on the other hand, would restrict the production and consumption of goods and reduce economic activity. This occurred, for example, when a recession followed the OPEC oil embargo in 1973.

The Department of Energy recently issued a report entitled "Energy Security" which underscores and provides detailed information regarding the economic and national security consequences of imports from a small group of countries for a substantial part of our oil needs (USDOE, 1987c).

Fostering Adequate Energy Supplies at Reasonable Costs

The general objectives of the United States energy policy as stated in DOE's 1985 National Energy Policy Plan (USDOE 1985) are to foster adequate energy supplies at reasonable costs. Adequate supply requires "...a flexible energy system that avoids undue dependence on any single source of supply, foreign or domestic, and thereby contributes to nation's security (and) implies freedom of choice about the mix and measure of energy needs to meet our industrial, commercial, and personal requirements" (USDOE 1985). The National Energy Policy Plan also recognizes that leasing federal lands is important in the Nation's effort to ensure long-term energy supplies.

Reducing Dependence on Imported Oil

The cost of imported oil to the economy goes beyond the price paid for the oil. Oil imports feeding the trade deficit can also require military protection, as well as reduce foreign policy flexibility. The importance of these factors grows in proportion to the extent the nation depends on imported oil. Because domestic production replaces oil imports, the nation benefits both from the savings that result when additional domestic oil production replaces imports and from a reduced vulnerability to supply disruptions. The contribution of the study area's oil resources should be gauged as a displacement of potentially costly and insecure imported oil by more secure production. The costs of a worldwide price change or a supply disruption will be less to the extent that the economy relies more on domestic supplies. U.S. oil reserves and production trends indicate greater vulnerability in the future, exacerbated by the declines of exploration and production that began in 1986-87. Thus, the study area's oil potential, which cannot be appraised until the area is leased and wells drilled, may assist in reducing the economy's vulnerability to world oil market changes.

Improving the Balance of International Trade

The deficit in the U.S. international trade balance has increased significantly in the last decade. For 1986, the cost of oil imports represented the single largest item in U.S. international trade accounts. The trade deficit totaled $170 billion (U.S. Department of Commerce 1987) and the gross cost of importing crude oil and refined petroleum products was $38 billion, or 22 percent of the deficit. If oil imports increase as currently projected, achieving a favorable trade balance would become almost impossible. This problem becomes increasingly severe as the price of imported oil increases. The deficit trade balance has meant that more U.S. dollars are spent on foreign goods, leaving fewer dollars available to U.S. consumers and business for U.S. goods and services and for capital expenditures. Production from the study area would reduce not only the need for imported oil, but also the amount of foreign exchange required to pay for imports, resulting in a more favorable trade balance.

Providing Federal, State and Local Revenues

Production from leases in the study area could generate revenues to the federal, state and local governments. Federal revenues would consist of bonuses, royalties, lease rental payments, and corporate income taxes. State and local revenues would include property, severance, conservation, and corporate income taxes.

Anticipated Markets for Study Area Oil

The potential oil production from the study area would be similar in quality to current north slope production. The markets for study area oil would, therefore, follow similar transportation and marketing patterns. Crude oil markets are already established for production from the north slope, and these markets would continue to be available for oil produced in the study area. Oil production from the north slope is transported to Valdez, Alaska via the Trans Alaska Pipeline System and from Valdez via tankers to ports on the west, gulf, and east coasts. The Trans-Panama pipeline paralleling the Panama Canal is used extensively to transport crude oil from the Pacific Ocean to the Atlantic for shipment to Gulf of Mexico, East Coast, Puerto Rico, and Virgin Islands refineries.

Major discoveries have been made on California's outer continental shelf areas in the Santa Barbara Channel and Santa Maria Basin, and elsewhere. This potential production could effectively displace a portion of future north slope production that would otherwise be marketed on the west coast. However, production from known north slope fields is projected to begin declining in 1990 and to fall to approximately 30 percent of the current level by the year 2000. Crude oil production from the study area is not projected to be on-line until the mid 1990s or later. Therefore, the market opportunities for the CAMA area's oil could be available replacing current north slope markets. Because of the statutory ban on export of U.S oil, the west coast market is well established as the primary area for north slope crude.

Continued Use of the Trans Alaska Pipeline System

The Trans Alaska Pipeline System is in place and would be available to transport oil from the study area. Such oil could play an important role in offsetting the production declines projected for the north slope in the early 1990s, thereby reducing the per-barrel transportation costs for oil from existing and newly discovered fields. Transportation of the study area's oil would, therefore, prolong the useful life of TAPS and permit production from north slope fields which would otherwise be uneconomic.

Finding

Leasing in the study area should be authorized in order to evaluate its oil and gas potential. If operations are economically justifiable, domestic production could be increased which would benefit the U.S. economy.

Findings: Wilderness Resources

The National Interest in Preservation of the Wilderness Characteristics of CAMA Lands

After conducting a wilderness study consistent with the Wilderness Act of 1964 as amended and the Wilderness Study Process as outlined in the Federal Register (Vol.47, No. 23, Feb. 3, 1982), it is found that a 41,000-acre area of the Upper Nigu River is suitable for wilderness designation. This finding rests on the wilderness study process followed by BLM in the preparation of the Central Arctic Management Area Wilderness Recommendations and Final Environmental Impact Statement (USDOI, 1988). The land status, energy transportation needs, existing development facilities, and management of lands adjacent to CAMA were factors taken into account in this study process. The consideration of these elements is summarized here.

Land Status Considerations

With the passage of ANILCA in 1980, federal lands within the study area totalled approximately five million acres. At that time, these lands were in relatively large contiguous blocks and unselected by the State of Alaska. In 1982 the State of Alaska selected large portions of the study area. Consequently, the original study area addressed by ANILCA was broken into a large number of relatively small, discontinuous blocks of federal land. Many of these small blocks of land are also in a selected status awaiting possible conveyance to either the State of Alaska or to the Arctic Slope Regional Corporation. The final pattern of land ownership within CAMA will not be clarified until the process of selection and conveyance (and relinquishment) of lands as authorized under the Alaska Statehood Act of 1958 and under the Alaska Native Claims Settlement Act of 1971 is complete. The State's right to select lands does not expire until 1994.

Energy Resource Transportation Considerations

The present scattered nature of federal lands and their location adjacent to private and state lands were taken into consideration during the wilderness study process. Fulfillment of the stated national need for oil and gas resources is directly affected by the study area land ownership patterns, especially if wilderness status is considered within a multiple-use resource use determination. Although not a major consideration in a suitability determination, the transportation of oil and gas resources across study area lands (both federal and nonfederal lands) becomes a factor in balancing the national need for wilderness with the national need for oil and gas.

ANILCA also defined a transportation corridor (Sec. 1431j) one township wide, leading west from TAPS to reserve access to a region of Arctic Slope Regional Corporation (ASRC) land holdings. Congress reserved this corridor to assure access to these ASRC lands and to allow for the transportation of oil and gas from the selected area. Various portions of this corridor have subsequently left federal ownership because they were conveyed to ASRC. ASRC exchanged some of these lands with the National Park Service and they are now incorporated into the Gates of the Arctic National Park and Preserve.

Existing Facility Considerations

ANILCA defined the study area as including that portion of the Utility Corridor north of 68 degrees north latitude. The Corridor is broken into two parts; an inner Corridor (540,000 acres) and an outer Corridor (490,000 acres). Portions of the Dalton Highway, the Trans Alaska Pipeline System, three Alyeska pump stations, Alaska Department of Transportation road maintenance facilities, two large airstrips, and a University of Alaska research facility are within the federally managed inner Corridor. A determination of nonwilderness for an area roughly corresponding to the inner Corridor was made by BLM in 1980 (USDOI 1980) as part of the overall process of reviewing a right-of-way application for the Alaska Natural Gas Transportation System (ANGTS). The ANGTS federal right-of-way was granted in 1980.

Finding

With these considerations in mind, the upper Nigu area is found to be suitable for wilderness designation.

Findings: Wildlife Resources

Impacts of Oil and Gas Exploration, Development, Production, and Transportation and Other Human Activities.

In analyzing impacts of oil and gas development and other human activities on wildlife populations within the study area, it is impossible to give precise demographic or population change predictions of what might result from a broad range of potential development actions. Instead, these findings indentify the sensitivity of different wildlife populations and the potential effects of various development actions on wildlife and their habitats. The potential impact from any action occurring will depend on many factors, including, but not limited to, the exact location of development in relationship to wildlife populations, the duration of development activities, and the scheduling and size of these activities. The discussion below is divided into findings related to exploration activities and development activities.

Terrestrial Wildlife

Exploration Activities

Except for aircraft operations, all present exploration activities within the study area are conducted only during winter months (October-May). Aircraft operations during the summer months can be accomplished with minimal effects to wildlife populations if appropriate mitigative measures are used.

Within the study area, winter exploratory activities can be conducted with minimal effects to wildlife populations and habitats if they are properly planned, conducted under appropriate stipulations, and closely monitored to ensure compliance. In 1982 BLM conducted a caribou and waterbird impact analysis workshop to develop appropriate mitigation measures for oil and gas exploration. It was determined that winter exploratory drilling operations and activities will have little or no significant effects on caribou, if they are conducted using appropriate protective measures (Gilliam and Lent 1982).

Winter exploration activities do affect the animals immediately adjacent to the drilling operations. However, the area of disturbance is generally small and most animals will not be significantly affected as they move away to avoid the disturbance.

Recommended protection measures, in the form of recommended stipulations to be placed on oil and gas exploration and development activities, are provided in Section 4 of this report.

Caribou

Caribou are widely scattered during the winter months and concentrated in large groups during spring and fall migrations. They are generally more susceptible to disturbance during the spring and summer months. Any exploration activity occurring within this time frame (May to August) is more likely to cause adverse impacts to caribou than at other times of the year.

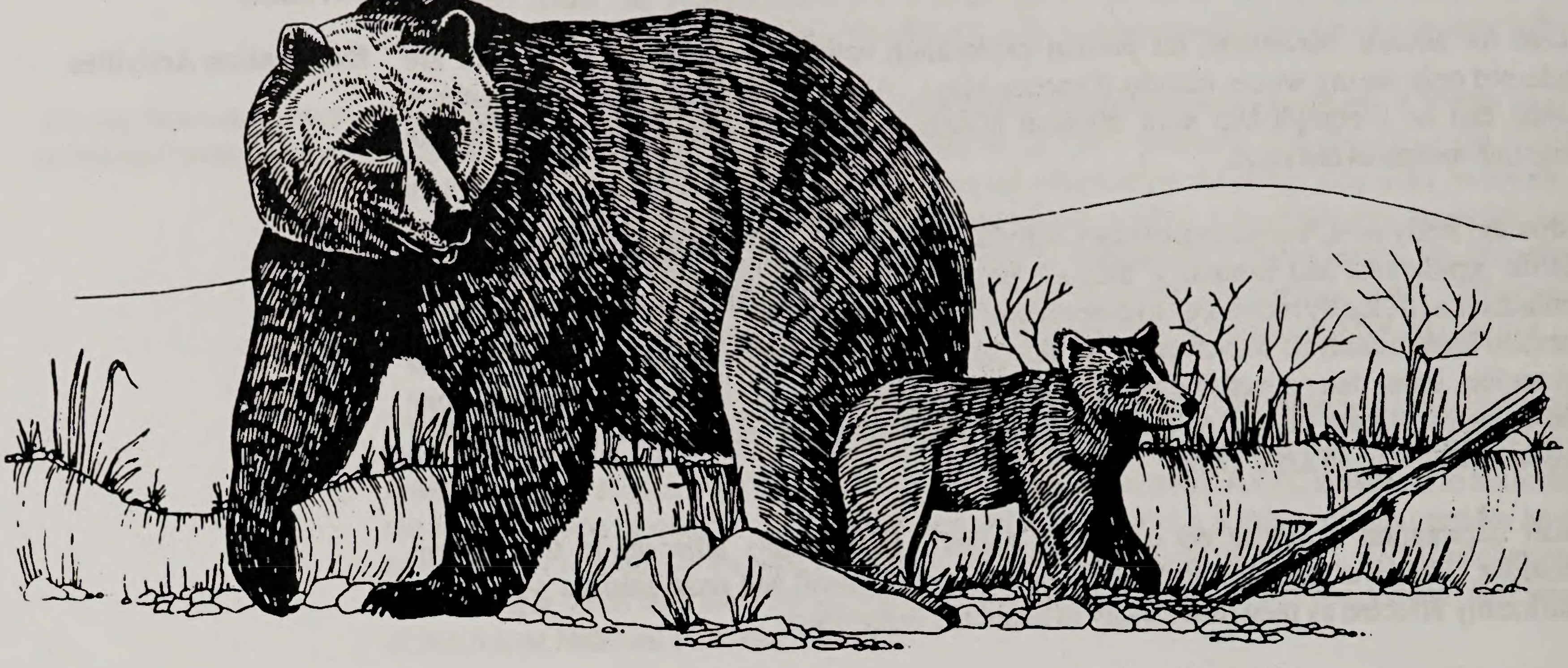
The potential for environmental contamination exists with any drilling activity because a variety of substances (crude oil, various fuels, drilling muds and other liquid and solid wastes) are present at these sites. Among the most toxic compounds are polyaromatic hydrocarbons, such as napthalenes, and a wide spectrum of heavy metals, such as arsenic, chromium, manganese, lead, mercury, copper and zinc. Avoiding crucial habitats whenever feasible and providing adequate protection against possible contamination are necessary considerations when planning drilling sites.

Moose

During winter months moose are concentrated within the riparian zones of major rivers within the study area. Because riparian zones make up a very small percentage of the total acreage, they are considered crucial habitat for moose during the winter months. Winter exploration activity within these riparian zones would disturb those animals immediately adjacent to the activity. However, it is not anticipated to cause any long term or any significant affect on the overall moose population.

Grizzly and Polar Bear

In the summer months, grizzly bears are found throughout the study area, while polar bears are found only off-shore on the polar ice cap and are not within the study area. Winter exploration activities can disturb both grizzly and polar bears within their dens, which may cause reproductive



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failure for that year. However, under standard stipulations presently in effect for winter exploration it is not anticipated that any significant impacts will occur from these operations. Summer operations (limited to aircraft) will have little if any effect on grizzly bears under the standard stipulations presently in effect for the study area.

Furbearers

Winter or summer exploration activities will have little if any effect on furbearers within the study area. These animals are very mobile and will move out of the area of disturbance.

Raptors

There are only two raptor species present within the study area during the winter months, gyrfalcons and snowy owls. Gyrfalcons are concentrated along the riparian zones where the main prey, ptarmigan, are found. Snowy owls are found throughout the tundra areas where the main prey (voles, mice, and lemmings) are found. Summer operations (limited to aircraft) will have little if any effect on raptors under the standard stipulations presently in effect for the study area.

Migratory Waterfowl

There are no migratory waterfowl found within the study area during the winter months. Summer operations (limited to aircraft) will have little if any effect on migratory waterfowl under the standard stipulations presently in effect for the study area.

Threatened and Endangered Species

There are no known threatened and endangered wildlife species within the study area during the winter months. Operations conducted during the summer months by aircraft will have little if any effect on threatened and endangered species under the standard stipulations presently in effect for the study area.

Development Activities

Impacts associated with exploration activities for oil and gas are generally acceptable when appropriate season and location stipulations are applied to areas of crucial use. However, impacts associated with the development of producing fields cannot always be avoided. Impacts associated with development are generally more permanent (20 years or more) than those of exploration activities (.5 - 2 years).

Caribou

Pipelines, roads, and associated human activities can directly and indirectly affect caribou calving, behavior, migration, and distribution. Studies have shown that pipeline or road complexes, and associated human activities, have resulted in direct and indirect impacts on caribou.

The oil and gas development and pipeline transportation scenarios presented in this report occur within areas that are annually used by the Central Arctic, Western Arctic, and Porcupine caribou herds. Because caribou use the study area on a year-around basis for summer and winter foraging areas as well as migration routes, some interaction can be expected to occur with any one or more of these development and pipeline scenarios. The disruption of caribou migration patterns could occur when animals attempt to avoid development and pipeline activities.

Habitat Lost or Altered

Development of oil and gas fields requires a network of well pads, roads, and pipelines to tie the producing wells together and to allow for removal of the petroleum products to a collection point. Impacts such as roads, pipelines, well pads, airstrips, housing facilities, etc., could alter the natural drainage of an area. This has the potential for direct loss or modification of habitats by flooding or dewatering areas. Direct physical loss or modification of existing habitats through changed drainage patterns during oil and gas development would generally be small compared with the overall area available. However, if the small areas altered support large concentrations of animals or are used during crucial life-function time periods, there is a greater potential for impacts to caribou if these crucial areas are affected by habitat loss or alteration.

Potential for Disturbance

Pipeline and Facility Construction Activities

The calving and post-calving periods, May 15 through June 30, appear to be the most sensitive time for pregnant females and females with young. Klein (1979) concluded that female caribou with young show a much stronger avoidance of obstructions during the spring and summer than during other times of the year. Male caribou seem to be more adaptable to man-made features, accepting them more readily than females with young. Cameron et al (1979) concluded that cows and calves appear to be more sensitive, more easily alarmed, and more likely to flee from a potential threat than male caribou. Whitten and Cameron (1983) concluded that female caribou avoid areas of petroleum-related activity, while bulls appear to be less sensitive. Cameron (1979) suggested that pregnant cows and cows with calves react strongly to disturbances and will move to areas of less activity. In the worst case, oil field development could result in caribou being displaced from previously occupied calving areas.

Pipelines, roads, and associated human activities may also disrupt migration patterns and overall distribution of a caribou herd. It has been reported that caribou readily crossed berms where the height was less that 1.2 meters (4 ft.), while encounters of berm heights of greater than 1.2 meters generally invoked a greater avoidance response. Klein (1979) concluded that roads and pipelines in open terrain could be more disturbing to caribou than roads and pipelines in forested areas. In areas where the Dalton Highway and the Trans-Alaska Pipeline System parallel each other, caribou tended to panic when they were between the two obstacles if traffic was present (Curatolo et al 1982). Klein (1979) found that caribou generally showed greater avoidance of traffic and other human activities than of physical features such as roads and railroads. Lawhead (1984) found that caribou would cross roads within an oil field complex without major problems. In July, 1984 approximately 50 percent of observed animals (9,000) did successfully cross the Oliktok Point road within the Kuparuk oil field. Murphy (1984) found that caribou used crossing ramps where the ramps were in optimal locations. Over 50 percent of the animals crossing at locations without ramps had a moderate to severe reaction to vehicular traffic, while only 10 percent of those crossing ramps had a moderate to severe reaction.

Aircraft A primary concern regarding oil development is the effect of aircraft on caribou, especially during the calving season. Caribou disturbed by aircraft react directly with fright/flight behavior and physiologically with increased heart rate. The escape response, which may produce injury, is most easily observed, although it should occur infrequently and only if overflights are extremely low and numerous. The long-term physiological effects are very difficult to quantify and document. They are subtle in nature, and require many disturbances before becoming recognizable.

Wildlife reactions to aircraft have been noted by a number of researchers when aircraft were operating at low altitudes. Miller and Gunn (1979) found that at least some percentage of all caribou groups observed reacted to helicopter over-flights at less that 400 meters (1,310 ft.). They concluded that cow-calf pairs were the most responsive to disturbance, while bulls were the least responsive of the sex/age group types observed. They suggested that the minimum altitude for aircraft during calving and post calving should be greater than 600 meters (1,967 ft.), and during the winter should be greater that 300 meters (985 ft.).

McCourt et al (1974) found that caribou reacted more strongly to helicopters (Bell 206) than to fixed-wing aircraft (Cessna 185) at low altitudes of less than 90 meters (300 ft.). They found that the reactions of caribou to aircraft disturbances decrease as the altitude of the aircraft increases, up to an altitude of approximately 300 meters (985 ft.). Reactions to aircraft above 300 meters were infrequent. They concluded that an altitude of 300 meters should be used as a minimum aircraft over-flight altitude.

Other Human Activities Roads and airstrips provide access for increased sport and subsistence hunting, and they can also account for animal fatalities due to collision with vehicles. Permanent roads and airstrips that are needed for a developed oil and gas field could change the overall distribution of hunting within an area. Hunters are quick to use new roads in areas once difficult to access. An example of this is Umiat, located along the Colville River, which was originally established to support oil and gas and related activities in the late 1940s. The Umiat airstrip is now being used by many moose and caribou hunters as a major access point. In 1984, this well-developed airstrip allowed a group of hunters to use a DC-4 to provide fuel for smaller aircraft and to transport hunters and meat (J. Trent ADF&G, personal communication).

Noise (excluding vehicular traffic and aircraft noises) from stationary sources does not seem to have any significant impact on caribou. Klein (1979) concluded that caribou readily adapt to sounds associated with nonvisable sources and fixed objects, such as compressor stations, drill rigs, etc.

Contamination

Environmental contamination could occur during oil and gas development activities. Contamination can result from spills of fuel and drilling mud additives and from solid waste disposal. Operators are required to develop and implement spill and contamination prevention plans. There are many stipulations and requirements established by BLM (see Appendix A for a complete listing of standard stipulations), the Federal Environmental Protection Administration, the State of Alaska and the North Slope Borough. All of these stipulations are aimed at preventing undue contamination of the environment. In-place stipulations and adequate monitoring should alleviate contamination of the environment that would significantly affect the study area's wildlife and their habitat.

Moose, Muskoxen, Grizzly and Polar bears, and Furbearers

Construction of roads, material sites, airstrips, and drilling pads within riparian zones cause a direct loss of crucial habitat for these species. An indirect loss of crucial habitat will occur if an oil and gas field or pipeline transportation system is built immediately adjacent to riparian habitats.

One of the greatest threats to grizzly and polar bears and furbearers is human-induced mortality. Encounters between these species and people will increase as more development occurs. These species may become nuisance animals near camps and have to be destroyed. Grizzly bears, polar bears, and furbearers may abandon traditional denning areas if development of an oil and gas field occurs near denning habitats. The long-term impact of this indirect loss of habitat could be the abandonment of denning sites in localized areas.

Roads and airstrips provide access which can increase sport and subsistence hunting, but they can also account for animal fatalities due to collision with vehicles. Permanent roads and airstrips that are needed for a developed oil and gas field could change the overall distribution of hunting within an area.

Migratory Waterfowl

Filling of wetland habitat with gravel for construction of roads, drilling pads, airstrips, and transportation corridors will cause a direct loss of nesting habitat for waterfowl and shorebirds. The long-term impacts of this habitat loss will depend on the specific location of disturbance area in relationship to prime nesting and foraging habitats and size of area disturbed. Loss of wetland habitats may also occur by contamination from fuel spills, drilling mud additives, and solid waste.

Direct mortality of birds could result from collisions with road traffic, aircraft traffic, and towers. Direct mortality of eggs and young could occur during the nesting season from disturbances caused by aircraft overflights at low altitudes, off-road vehicles (3- or 4-wheelers), and humans hiking in the area.

Raptors

Construction of roads, material sites, airstrips, and drilling pads within nesting and/or foraging habitats will cause a direct loss of habitat for raptor species. An indirect loss of habitat could occur if an oil and gas field or pipeline transportation system is built immediately adjacent to these nesting or foraging habitats. The long-term impact of this indirect loss of habitat could be the abandonment of nesting sites in localized areas. Aircraft operations associated with development activities near nest sites can significantly disturb nesting raptors. This disturbance can cause a loss of eggs or young, depending on the particular weather conditions and duration of disturbance.

Threatened and Endangered Species

Construction of roads, material sites, airstrips, and drilling pads within nesting or foraging habitats could cause a direct loss of critical habitat for the peregrine falcon. A further, indirect loss of critical habitat can occur if an oil and gas field or pipeline transportation system is built immediately adjacent to these nesting or foraging habitats. The long-term impact of this indirect loss of habitat could be the abandonment of nesting sites in localized areas.

Aircraft operations associated with development activities near nest sites can significantly disturb nesting peregrine falcons. This disturbance could cause a loss of eggs or young, depending on the particular weather conditions and duration of disturbance.

Activities that affect habitats used by waterfowl, shorebirds, and passerine birds can indirectly affect peregrine falcons through a reduction of prey species.

Aquatic Resources

Development Activities

Effects of oil and gas exploration, development, production, and transportation and other human activities on aquatic wildlife resources.

Impacts associated with oil and gas exploration activities can generally be avoided or mitigated using appropriate season and location stipulations (see Appendix A). Exploration activities usually do not require road building. In some cases, ice drilling pads have been used instead of conventional gravel pads. Where these methods are employed, effects on fisheries resources are minimized. The potential for contaminating a watershed with spilled fuel, drilling muds, crude oil and various other chemicals still exists, but impacts associated with gravel removal from streambeds or soils disturbances is significantly reduced or eliminated.

In situations where gravel sources are necessary to construct drilling pads, major alterations or loss of crucial habitat can result, particularly because crucial habitat is not well defined throughout most of the study area. Alterations, loss, and contamination of aquatic habitat and direct mortality are major effects that could result from oil and gas development, production, and transportation. The degree of impact would depend on the extent of development and the care with which it is executed (the larger the development project, the greater the risk to aquatic resources).

Alterations and loss of habitat

Activities associated with oil and gas development, production, and transportation would reduce or alter aquatic habitat within the study area to some extent depending on the degree of development. Due to limited fisheries inventories within the study area, crucial aquatic habitat used for migration, spawning, rearing, and overwintering has not been specifically identified. Because exact areas of oil and gas development are unknown at this time, reliable estimates of fisheries habitat impacts can not be determined. However, information is available on the types of effects associated with certain development activities. The most obvious impacts would result from extensive gravel removal from streambeds. Gravel is required for construction of roads, drilling pads, airstrips, and stream flow and channel modifications at stream crossings for roads and pipelines. These activities would have direct and indirect effects on fishery habitat, possibly crucial spawning and overwintering habitat, and migration routes.

Potential effects :

1. direct alteration and loss of crucial habitat where crucial habitat is not identified before removal of gravel from streambeds;

2. blockage and rerouting of stream channels resulting in changes of flow regimes, dewatering of crucial habitat areas, and creation of possible migration barriers such as improperly placed culverts;

3. high silt concentrations resulting in reduced primary production, reduced numbers and diversity of benthic organisms, mortality of fish eggs and larvae, and disruption of fish dependent on sight feeding; and,

4. heavy sediment deposition resulting in barriers to migrating fish and the filling in of crucial overwintering habitat (deep holes) in streams.

Potential
Contamination of habitat

Potential for actual discovery of economically recoverable oil in CAMA is less than 19 percent (USDOI 1988). However, habitat contamination could result from oil and gas exploration, development, production (if it should occur) and transportation, particularly during construction periods. Under a worst case scenario, contamination could be a significant problem for fisheries. This is particularly true when fish are concentrated in limited areas for spawning or overwintering. Contamination of a hydrologic system within the study area by oil, drilling mud additives, fuels, hazardous chemicals or heavy metals could be significant, depending on the degree and location of the spill (USDOI 1987a). Isolated small lakes with no outlet could result in a localized reduction in population numbers if contaminated, but it would not be significant to the study area as a whole (USDOI 1985). Again considering a worst case situation, contamination of the Colville or Sagavanirktok Rivers, one of their tributaries, or any major stream could cause effects of major significance on the overall fishery population within the study area.

Spills are usually small and controlled in relatively short time, but impacts would still occur. Aquatic impacts include reduced numbers and diversity of benthic organisms, mortality of fish in sensitive life stages, reduced water quality and the potential for contaminating terrestrial organisms. Animals using the spill area can suffer from a variety of physical, physiological, and ecological problems as the result of contamination (USDOI 1985). Natural recovery usually cleans up most short-term impacts fairly quickly and human assistance can speed the process. Most impacts are temporary.

Large spills, if they should occur, are more environmentally devastating and resulting impacts require extended periods of recovery. Recovery time is of particular significance in the Arctic. Because of extremely slow rates of productivity in both terrestrial and aquatic ecosystems, recovery could require decades. Under a worst case scenatio aquatic impacts may include elimination of all aquatic life forms throughout the watershed except the most tolerant, severally degraded water quality, and mortality of terrestrial organisms, particularly vegetation and waterbirds. Cleanup would require extensive human involvement and funding; natural recovery would generally not be possible in the short-term.

Potential for
Direct mortality

Activities such as seismic, drilling and water withdrawal from lakes and rivers during the winter months have the potential for direct mortality of fish. Explosives used in seismic activities can significantly reduce a localized fishery population. However, these types of operations were largely replaced by vibroseis techniques in the early 1980s (USDOI 1987b)

Drilling operations require large amounts of water that is relatively scarce during the winter months. Because of limited water quantities during the winter, potential for impacts from pollution and possible dewatering of lakes and streams exists.

Table 3.6 summarizes the anticipated impacts on resources within the study area. Impacts on aquatic resources are shown relative to oil and gas development. The more development

Table 3.6
Summary of Transportation Routes, Production Potential, Economic Feasibility, Effects on Wildlife, and Wilderness Values

	Transportation Routes				
	Route 1	**Route 2**	**Route 3**	**Route 4**	**Route 5**
Oil and Gas Development					
Production potential	High potential due to the 19% chance of economically recoverable oil from the Arctic National Wildlife Refuge (DOI 1987).	High potential due to the Colville River Delta discovery of economically recoverable oil and gas.	High potential due to existence of the Umiat discovery	High potential due to the numerous untested oil and gas traps which exist in the surrounding area.	High potential in the corridor given untested structures.
Economic Feasibility	High feasibility given discoveries in the Arctic National Wildlife Refuge or additional offshore reserves in the Point Thompson area or in the area north of ANWR.	High feasibility since the Colville River Delta discovery proves to be economic. Feasibility enhanced by additional reserves found onshore, offshore or in the National Petroleum Reserve - Alaska.	Moderately feasible. Dependent on major discoveries in the National Petroleum Reserve - Alaska or on economic discoveries made in the study area.	Moderately feasible. Dependent on major discoveries in the National Petroleum Reserve - Alaska or in the study area.	Moderate feasibility. Dependent on location of commercial discovery. However, due to close proximity to TAPS even gas might be economic for local uses.
Material Requirements					
Miles of Road and Pipeline Construction	55 miles	25 miles	85 miles	170 miles	20 miles
No. of Acres Directly Affected	825 acres	540 acres	1043 acres	3270 acres	970 acres
Gravel Needs	4,392,000 cubic yards	3,192,000 cubic yards	5,552,000 cubic yards	17,114,000 cubic yards	5,184,000 cubic yards
Environmental Costs					
Disturbance of Porcupine Caribou Herd	Moderate to low potential of interactions between caribou and development activities due to location of the pipeline occurring on the western edge of the normal habitat used by this herd.	No anticipated interactions between caribou and development activities due to location of the pipeline which is outside the normal habitat used by this herd	Same as Route 2	Same as Route 2	Same as Route 2

	Route 1	Route 2	Route 3	Route 4	Route 5
Disturbance of Western Arctic Caribou Herd	No anticipated interactions between caribou and development activities due to the location of the pipeline occurring outside the normal habitat of this herd	Same as Route 1	Moderate to low potential of interactions between caribou and development since the location of the pipeline occurs on the northwestern edge of the normal habitat range.	High potential for interaction between caribou and development. Pipeline route crosses over a major portion of the habitat used by this herd.	No anticipated interactions between caribou and development. Pipeline occurs outside of normal habitat range used by this herd.
Disturbance of Central Arctic Herd	Moderate potential of interactions between caribou and development. Pipeline would cross the northern edge of the spring and summer habitats.	Same as Route 1	High potential for impact due to the location of the pipeline crossing over a major portion of the normal habitat used by this herd.	Moderate potential of interaction between caribou and development. Pipeline crosses over the southwest portion of the habitat used by this herd.	High to moderate potential for interaction between caribou and development actions. Pipeline route crosses a portion of the herd's habitat.
Disturbance of Peregrine Falcons	No significant disturbance should occur since the pipeline route occurs well outside known nesting areas.	Same as Route 1	Moderate potential for disturbance since the pipeline would cross through peregrine falcon nesting habitat that is presently occupied each year.	Same as Route 3	Same as Route 3
Disturbance of Polar Bears	Moderate to low potential for disturbance due to the location of the pipeline. Proposed route occurs on the southern edge of the normal edge of the winter denning habitat.	Same as Route 1	No anticipated interactions with development actions. Pipeline route occurs outside areas of known denning.	Same as Route 3	Same as Route 3 1,518 acres
Indirect Effects on Terrestrial Wildlife	Wildlife populations within any development area (pipeline corridor, oil and gas field, etc.), if these areas are opened to the public, will be indirectly affected by increased access in the following ways: Additional hunting pressure (subsistence and sport), loss of animals due to collisions with vehicles and nuisance individuals around developments (effects on bears is of special concern here), and human disturbance from activities such as hiking, bird watching, and wildlife photography. Other indirect impacts would result from increases in noise from facility development, aircraft disturbance, and air and water contamination.				
Number of Suspected High Value Fishery Streams Crossed	Approximately 3 high value streams would be crossed including the Saganavirktok River. Depending on stream crossing methods, and mitigation, there is a potential affecting fish migration, stream flow regime and water quality.	Approximately 3 high value fishery streams would be crossed including the Colville River. Depending on stream crossing methods, and mitigation, there is a potential for affecting fish migration, stream flow regime and water quality.	Approximately 8 high value fishery streams would be crossed, including the Colville River. A high potential for disruption of fish migration, stream flow and water quality without the application of mitigating measures.	Approximately 15 high value fishery streams would be crossed by this route. A very high potential exists for affecting fish migration, stream flow and water quality without the application of mitigat--ing measures.	One high value fishery stream would be crossed by this pipeline and service road route. A moderate potential for affecting fish migration, stream flow and water quality without the application of mitigation measures.

	Route 1	Route 2	Route 3	Route 4	Route 5
Effects of Gravel Removal from streambeds	Moderate potential of altering stream flow regimes and degrading water quality to the point of impacting fishery migration and crucial habitat. This potential effect would be moderated by the location of the proposed pipeline and road being so close to the Beaufort Sea. Brackish esturine waters provide poor spawning habitat for the anadromous species	Same as route 1	High potential of altering stream flow regimes and degrading water quality to the point of affecting migrating and spawning fish and crucial habitat (spawning and overwintering areas). Application of appropriate mitigating measures would be critical	Same as route 3 with greater potential for impacts due to the larger number of streams crossed by this route.	Moderate potential of altering stream flow regimes and degrading water quality and crucial fishery habitat. Potential is lessened by the short length of the proposed pipeline routes and the small number of streams affected by construction activities.
Effects of Potential Oil Spills	Spills are usually controlled quickly but could result in reduced numbers and diversity of benthic organisms, increased mortality of fish in sensitive life stages, reduced water quality and potential contamination of terrestrial organisms. Natural recovery is usually possible in the short-term.				
Mitigation measures to protect fishery resources	Mitigation to protect crucial fishery habitat and watershed resources would include, but not be limited to the following: 1) Restrict gravel removal to large rivers, outside of the watered channels, but within the floodplain during low water periods and make every effort to maintain existing water flow regimes. 2) Reduce surface disturbances by mining deep gravel pits that can eventually be flooded and provide overwintering lake or river habitat. 3) Restrict construction activities on stream crossings of roads and pipelines to low water periods and install bridges or culverts to maintain historic flow regimes and reduce interference with fish migration. 4) On all streams potentially affected by oil and gas development, identify crucial habitat areas (spawning, rearing, and overwintering habitat) and avoid any direct alterations of these areas. 5) Allow no blocking of stream flow or stream channel redirection that will allow dewatering of spawning, rearing or overwintering habitat used by anadromous species. This also includes ensuring that culverts and other man made water structures do not freeze in winter or back up at high flow periods; 6) Work with the State of Alaska, Department of Fish and Game, to develop regulations that will ensure the preservation of existing fishery population levels and allow a sustained yield as demands for the resource increases.				

undertaken, the greater the opportunity for major aquatic impacts. For example, proposed utility corridors transecting the study area vary in length and the number of streams and rivers that would be crossed. Generally, longer pipelines cross more streams and therefore present more opportunities to contaminate a watershed. Gravel requirements would also have proportional potential impacts (more gravel taken from streambeds, the greater the potential for aquatic effects). When individual streams are affected by gravel removal, similar impacts may be significant for the entire watershed. If more than one stream in a watershed is used as a gravel source (likely within the Colville River watershed) synergistic impacts could occur.

The National Interest in Preservation of Wildlife Resources of the Study Area

International treaty obligations

Oil and gas activities within the study area could affect waterbird populations used by citizens of five countries: the United States, Canada, Mexico, Japan, and the Union of Soviet Socialist Republics. The United States has treaty obligations with these countries to provide for continuation of healthy populations of waterfowl that reside temporarily within our boundaries. There is presently a great deal of concern over declining waterfowl populations worldwide and the international implications of land management decisions concerning oil and gas development within the study area cannot be ignored. Also, the United States and Canada have an international agreement concerning the Porcupine Caribou Herd. Any management decisions concerning oil and gas activities within the study area must take the Porcupine Caribou Herd into consideration.

Threatened and Endangered Species protection needs

All federal agencies must adhere to the Endangered Species Act of 1973 as amended. It is the responsibility of each agency to promote the continued existence and enhancement of listed species within the lands they administer.

Subsistence needs

In the Arctic, interest in subsistence values is very high and fisheries are a valued subsistence resource. Fish make up an important part of the native diet on the north slope. Therefore, all precautions should be taken to preserve the fishery resources of the study area. Caribou are also highly valued as a subsistence resource and warrant similar preservation management.

Wilderness Impacts

Impacts from Alternative Wilderness Designation

The Central Arctic Management Area Wilderness Recommendations and Final Environmental Impact Statement (USDOI 1988) analyzed the impacts on identified resources of wilderness designation or nondesignation of 3,680,000 acres of federal CAMA lands [i.e. the CAMA Wilderness Study Area (WSA)]. These impacts were considered over a range of wilderness alternatives. These alternatives included:

1. BLM Proposed Action:

Designate the Upper Nigu block as wilderness (41,000 acres). This block of land is located in the southwestern corner of CAMA and is adjacent to the Gates of the Arctic Park and the Noatak National Preserve.

2. No Wilderness Alternative

Under this alternative no lands in CAMA would be designated wilderness.

3. All Wilderness Alternative

Under this alternative 3.4 million acres of the CAMA WSA would be recommended as wilderness. Only that area within the Utility Corridor.roughly corresponding to the lands visible from the Dalton Highway are not recommended for wilderness designation. This nondesignated area was determined nonwilderness in character in 1980 (U.S. Department of the Interior, BLM, 1980).

4. Partial Wilderness Alternative:

Under this alternative four blocks of land within the CAMA WSA (a total of 486,000 acres) would be recommended for wilderness designation. Wilderness characteristics in these four areas clearly exceed the wilderness values specified in the wilderness inventory guidelines.

5. Oolamnagavik-Etivluk Alternative

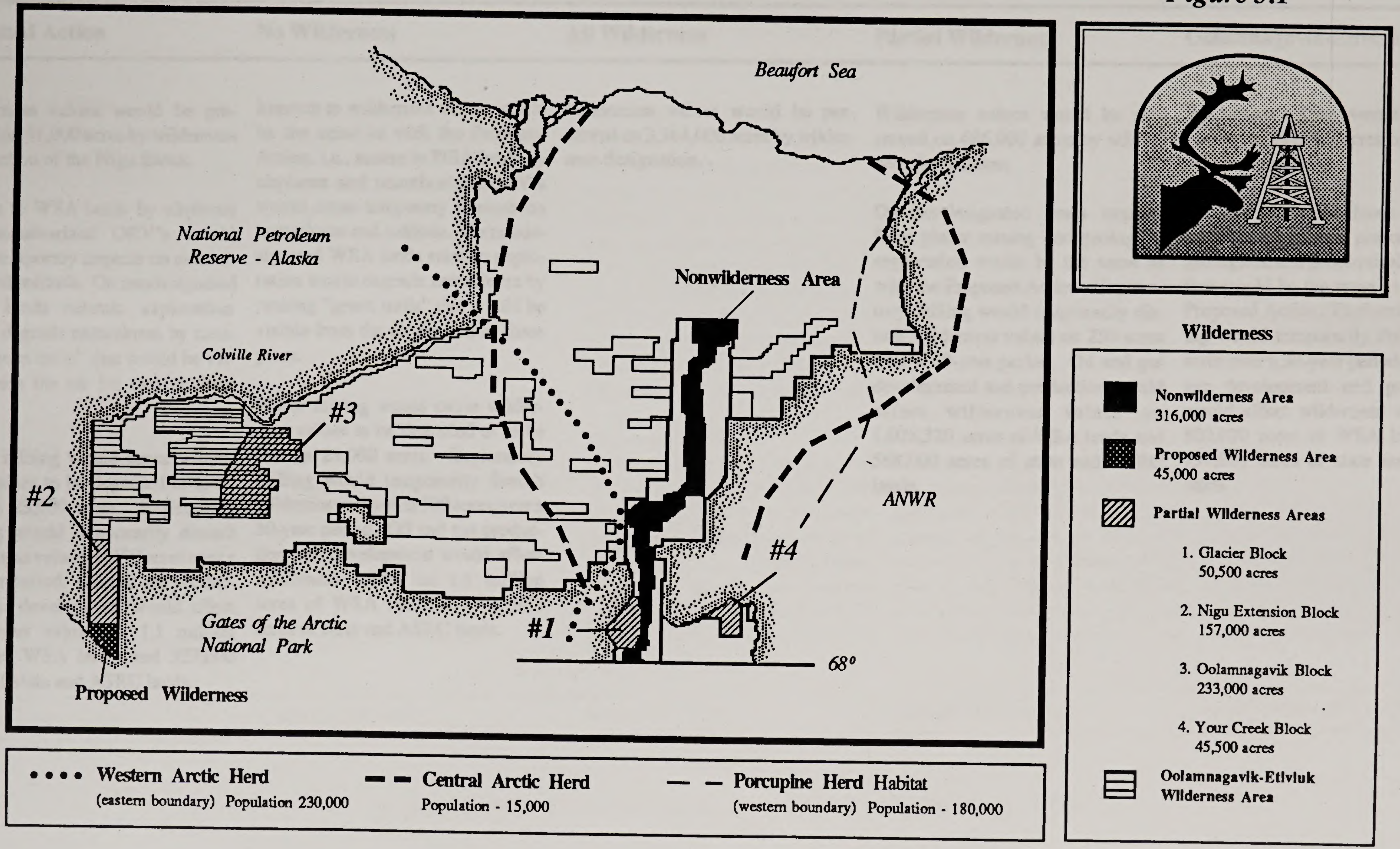
This alternative was created in response to public comment received on the draft wilderness EIS published in August of 1987. Under this alternative two blocks of land in western CAMA (a total of 867,000 acres) are recommended for wilderness designation.

Figure 3.1 displays each of these alternatives as well as caribou herd ranges within or near the study area.

The anticipated effects of wilderness designation were analyzed for all of these alternatives as part of the wilderness study process. Table 3.7 provides a summary of the anticipated effects of wilderness designation under each alternative. Anticipated effects summarized in Table 3.7 focus primarily on federal lands (the CAMA WSA). Information in this table was developed through the wilderness study process (see USDOI 1988).

Central Arctic Management Area: Wilderness Alternatives, Nonwilderness Areas and Caribou Herd Ranges

Figure 3.1


Beaufort Sea
National Petroleum Reserve - Alaska
Nonwilderness Area
Colville River
#3
#2
ANWR
#4
#1
Gates of the Arctic National Park
68°
Proposed Wilderness
•••• Western Arctic Herd (eastern boundary) Population 230,000
▬ ▬ Central Arctic Herd Population - 15,000
— — Porcupine Herd Habitat (western boundary) Population - 180,000
Wilderness
■ Nonwilderness Area 316,000 acres
▩ Proposed Wilderness Area 45,000 acres
▨ Partial Wilderness Areas
1. Glacier Block 50,500 acres
2. Nigu Extension Block 157,000 acres
3. Oolamnagavik Block 233,000 acres
4. Your Creek Block 45,500 acres
☰ Oolamnagavik-Etivluk Wilderness Area

Central Arctic Management Area: Wilderness Alternatives, Nonwilderness Areas and Caribou Herd Ranges

Figure 1.1

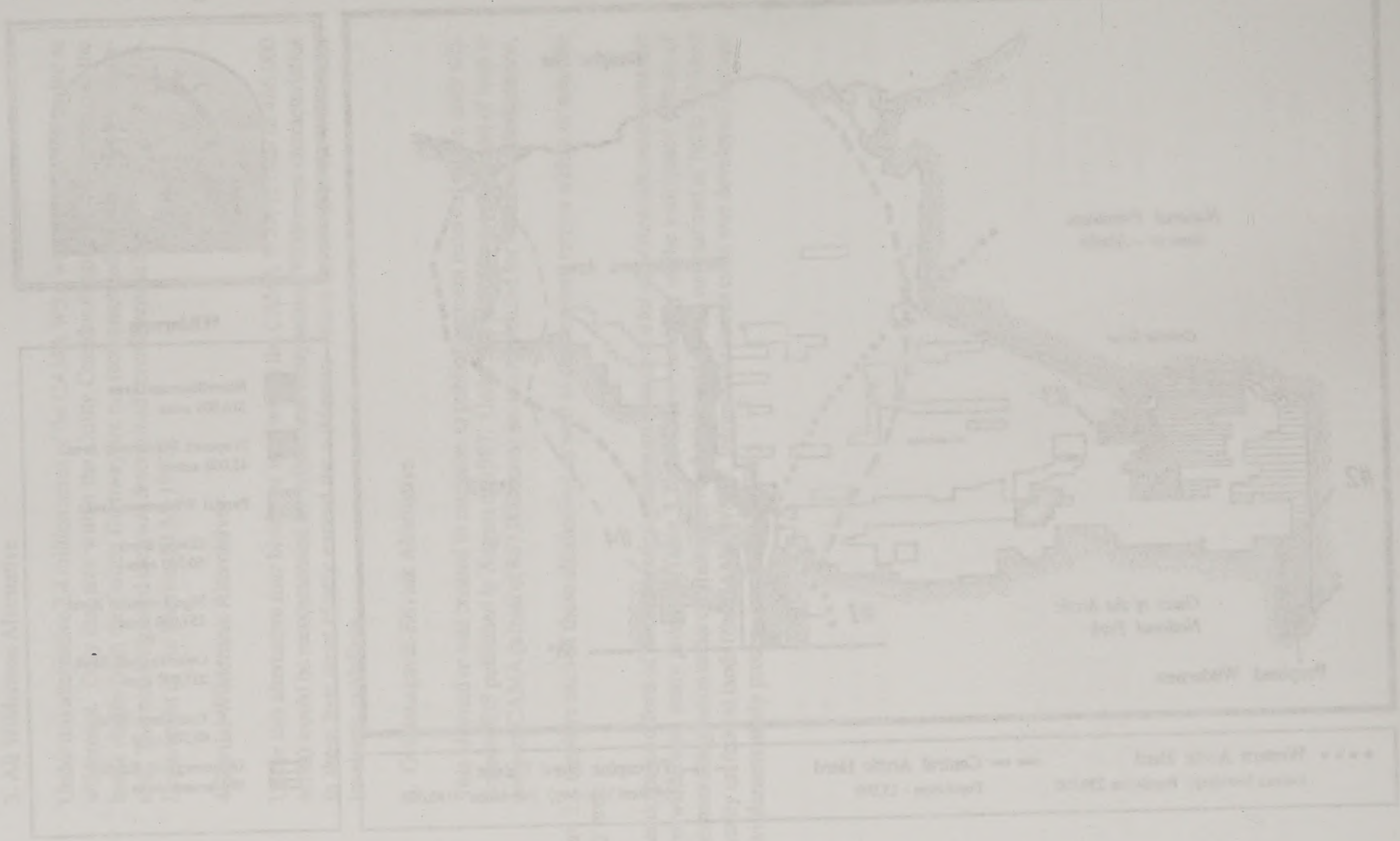


Table 3.7 COMPARATIVE SUMMARY OF IMPACTS RESULTING FROM WILDERNESS STUDY ALTERNATIVES

(see USDOI 1988 for complete description)

Wilderness Values

Proposed Action	No Wilderness	All Wilderness	Partial Wilderness	Oolamnagavik-Etivluk
Wilderness values would be preserved on 41,000 acres by wilderness designation of the Nigu Block. Access to WSA lands by airplanes and unauthorized ORV's would cause temporary impacts on naturalness and solitude. On nondesignated WSA lands seismic exploration would degrade naturalness by causing "green trails" that would be visible from the air for two or three years. Placer mining would cause wilderness values to be degraded or to be lost on 23,000 acres. Exploratory drilling would temporarily disturb wilderness values on 300 acres over a 30-year period. Oil and gas production and development would affect wilderness values on 1.1 million acres of WSA lands and 527,000 acres of state and ASRC lands.	Impacts to wilderness values would be the same as with the Proposed Action, i.e., access to WSA lands by airplanes and unauthorized ORV's would cause temporary impacts on naturalness and solitude. On nondesignated WSA lands seismic exploration would degrade naturalness by causing "green trails" that would be visible from the air for two or three years. Placer mining would cause wilderness values to be degraded or to be lost on 23,000 acres. Exploratory drilling would temporarily disturb wilderness values on 300 acres over a 30-year period. Oil and gas production and development would affect wilderness values on 1.1 million acres of WSA lands and 527,000 acres of state and ASRC lands.	Wilderness values would be preserved on 3,364,000 acres by wilderness designation.	Wilderness values would be preserved on 486,000 acres by wilderness designation. On nondesignated lands impacts from placer mining and geological exploration would be the same as with the Proposed Action. Exploratory drilling would temporarily disturb wilderness values on 250 acres over a 30-year period. Oil and gas development and production would affect wilderness values on 1,028,320 acres of WSA lands and 568,000 acres of state and ASRC lands.	Wilderness values would be preserved on 867,000 acres by wilderness designation. On nondesignated lands impacts from motorized use, placer mining, geological, and geophysical exploration would be the same as with the Proposed Action. Exploratory drilling would temporarily disturb 200 acres over a 30-year period. Oil and gas development and production would affect wilderness values in 800,920 acres of WSA lands and 731,000 acres of state and ASRC lands.

Oil and Gas Development and Transportation Routes

Proposed Action	No Wilderness	All Wilderness	Partial Wilderness	Oolamnagavik-Etivluk
It is anticipated that about 3,365,000 acres would be leased for oil and gas development. Thirty wildcat wells would be drilled in the WSA within a 30-year period, and six oil and gas fields would be developed within CAMA. It is anticipated that three oil/gas pipelines would be constructed and perhaps two of these routes would extend to oil/gas fields outside CAMA within the NPR-A. An annual average of 500 miles of geophysical exploration would occur. Since all WSA lands with high potential would be open to development, wilderness designation would not affect potential oil and gas development or associated oil/gas transportation systems.	Same as Proposed Action.	Potential oil and gas development on 3,090,000 acres would be foregone; potential for development of oil and gas resources in the southern portion of NPR-A would be reduced because the most practicable transportation routes would be precluded. Development on other CAMA lands would also be restricted. All wilderness would preclude the following anticipated activities: one placer mining operation, expected oil and gas leasing on 2,810,000 acres with high oil and gas potential (84% of the WSA lands with high potential), 26 wildcat wells within a 30-year period, development of four oil and gas fields within CAMA, and the probability of developing and producing oil from southern NPR-A.	Although 3,194,000 acres would be open to development, only 3,067,000 acres of high potential lands would be leased. It is anticipated that 25 wildcat wells would be drilled on WSA lands within 30 years, 6 oil and gas fields would be anticipated within CAMA. Three pipeline routes would be developed within CAMA, two of which would extend to NPR-A. Costs of pipeline access to NPR-A across southern CAMA would be slightly higher as a result of this alternative. On nondesignated lands geophysical exploration would be similar to that described for the Proposed Action.	Potential development on 867,000 acres (26% of the WSA with high potential for oil and gas occurrence) would be foregone. This would preclude an anticipated 10 wildcat wells within a 30-year period and one oil field. It is anticipated that 2,463,000 acres would be leased. About 20 wildcat wells would be drilled on WSA lands within a 30-year period. Five oil and gas fields would be anticipated within CAMA and at least one field outside CAMA in NPR-A. To transport the oil or gas, three pipeline routes would be anticipated, one of which would cross southern CAMA to NPR-A. Overall cost of this pipeline could be 5 to 10 percent higher than with the Proposed Action.

Locatable Minerals

Proposed Action	No Wilderness	All Wilderness	Partial Wilderness	Oolamnagavik-Etivluk
Although 3,639,000 acres would be open to mineral location and development outside the designated wilderness, only one placer mine would be expected. This would disturb an estimated 250 acres over the life of the mining operation.	Although 41,000 more acres than under the Proposed Action would be open to mineral location and development, the anticipated level of mineral activity would be the same as described for the Proposed Action.	Since 3,090,000 acres would be closed to location and entry, one placer mine would be precluded.	Although 3,194,000 acres would be open for development, no mining would be anticipated because much of the area with the greatest likelihood for a placer operation would be closed to location and entry as a result of this alternative. Therefore, one placer mine would be precluded.	Although less area would be open to mineral location and development (2,813,000 acres) as compared to the partial wilderness alternative, the amount of mining activity would be the same as the no wilderness/no action alternatives (and Proposed Action) because the area with the greatest likelihood for a placer operation would be open to entry and location.

Subsistence

Proposed Action	No Wilderness	All Wilderness	Partial Wilderness	Oolamnagavik-Etivluk
There would be potential adverse effects on subsistence use patterns in the areas not designated as wilderness. Some of these impacts could be temporary, but some may be long-term. There would also be a potential impact to subsistence use patterns if a pipeline were built along route B; however, mitigation measures that would be determined and applied at such time would cause an actual significant restriction to subsistence to be unlikely. Furthermore, because of the small areas involved in the total subsistence land usage of the villages using the WSA, the Proposed Action would result in no significant restriction to subsistence uses or resources for any of the villages using the WSA lands for that purpose.	Same as the Proposed Action.	There would be no adverse effects on subsistence use patterns or resources.	Although pipeline B is rerouted from the no wilderness alternative to avoid the Oolamnagavik block wilderness area, the total affected subsistence area used by Anaktuvuk Pass Village would not change. There would be no mining to affect the Nolan/Wiseman subsistence area. Otherwise the impacts would be the same as the Proposed Action.	Although pipeline B is rerouted from the no wilderness alternative to avoid the Oolamnagavik wilderness area, the total affected subsistence area used by Anaktuvuk Pass Village would not change. Therefore, the impacts would be the same as the Proposed Action.

Socioeconomic Impacts

Proposed Action	No Wilderness	All Wilderness	Partial Wilderness	Oolamnagavik-Etivluk
This alternative would not preclude potential future oil and gas or mining development. This development could create oil development related jobs, of which less than 3% would accrue to local rural residents. This oil and gas development would also generate public revenues to Alaska from revenue sharing of royalty payments, severance taxes, and property taxes.	Same as Proposed Action.	This alternative would greatly reduce the potential for future oil and gas and placer mining related employment, income, population, and public revenues as long as the area is managed for wilderness.	This alternative would not prevent future increases in employment, income, population, and public revenues associated with oil and gas development. No mining related employment would be anticipated.	Same as Proposed Action except the level of development is anticipated to be 20-30% less because one less oil field would be developed.

Section 4
Recommendations

Section 4
Recommendations

Introduction

This section of the report presents study recommendations required by ANILCA Section 1001(b)(1-3). These recommendations focus on the following:

1. the future use and management of oil and gas resources in the study area, and the projected transportation needs associated with the development of these resources;

2. the suitability and nonsuitability of the area for wilderness designation; and,

3. on protection measures for study area wildlife and wildlife habitat.

Recommendations

Future Use and Management of Oil and Gas Resources

With the exception of the 41,000 acre Upper Nigu Block proposed for wilderness designation it is recommended that all federal lands in the ANILCA 1001 study area (approximately 3.6 million acres) be opened to oil and gas exploration and development. Under BLM's Mineral Potential Classification System, a large majority of the Central Arctic Management Area has been evaluated as having a high potential for oil and gas occurence. Opening these lands for oil and gas exploration and development would potentially contribute to the nation's need for these vital resources.

It is further recommended that stipulations controlling both exploration and development be applied to provide adequate protection for the area's delicate surface and wildlife values. All stipulations in Appendix A will apply.

Future Management of Oil and Gas Transportation Needs

The five pipeline routes considered in Section 3 rely on assumptions addressing the pattern of oil and gas discoveries in the study area, as well as in adjacent lands (NPR-A and ANWR). These routes provide a hypothetical backdrop for the consideration of impacts on wildlife and wildlife habitat. The economic viability of these routes largely depends on discoveries both on study area lands and on lands adjacent to the area.

Depending on the emerging patterns of producible oil and gas discoveries in the area, there may be a need to consider pipeline routes not covered in this report. It is recommended that any proposed transportation route in the study area be fully considered in light of the pattern of discovery mentioned above. Alternatives to any pipeline route should properly be considered as part of a detailed Environmental Impact Statement at the time a route is proposed. Once alternative routes to access production areas are proposed, it is recommended that respective Environmental Impact Statements focus attention on alternative measures to protect wildlife and wildlife habitat, with a special emphasis on the protection of those subsistence resources which may be impacted.

Wilderness Recommendation

The 41,000-acre upper Nigu River block of CAMA is recommended for wilderness designation. The Nigu block is located in the southwestern corner of the study area. This block lies adjacent to already established wilderness areas — the Gates of the Arctic National Park to the east and the Noatak National Preserve to the southwest. The upper Nigu exhibits excellent scenic qualities afforded by the mountainous terrain and the broad Nigu River valley. The Nigu River itself is an untrammeled riverine ecosystem originating in the Gates of the Arctic National Park, flowing through the Nigu Block, and draining into the Colville River. Outstanding opportunities to experience solitude are afforded within this recommended area. This area is representative of the northern Brooks Range foothills wildlife habitat and during spring and fall caribou pass through the area in significant numbers.

The location of the Nigu Block compliments, and to some extent enhances the wilderness values and attributes of the two adjacent wilderness areas. Nigu Block lands meet all of the wilderness requirements and represent an excellent example of the Brooks Range Province ecosystem.

The remainder of CAMA (3.6 million acres) is found to be nonsuitable for wilderness designation. All of these lands fall within areas of high oil and gas occurence potential. Approximately 9 percent of the nonsuitable lands are also rated as having moderate potential for locatable minerals. The majority of these lands are encumbered by state and/or Native selections or have been designated as transportation corridors [e.g., ANILCA Section 1431(J) corridor, and the TAPS corridor]. These encumbrances diminish the ability to manage these lands for their wilderness values in perpetuity.

Table 4.1 summarizes the wilderness suitability recommendations.

Table 4.1
Summary of Wilderness Suitability Recommendations for the Study Area

Description	Acres
Total Federal Lands in the Study Area	3,680,000
Federal Lands Recommended Suitable	41,000
Federal Lands Recommended Unsuitable	3,639,000 *

* This figure includes the 316,000 acre nonwilderness assessment area (see USDOI 1980)

Table 4.2 provides a legal description of the Nigu area recommended for wilderness designation.

3. Restrict construction activities to low water periods on stream crossings of roads and pipelines and install bridges or culverts to maintain historic flow regimes and prevent interference with fish migrations. This restriction allows construction to proceed, while minimizing siltation, channel modification, and obstructions to fish migration.

4. On all streams where oil and gas development may have an impact, identify crucial habitat areas (spawning, rearing, and overwintering habitat) and avoid any direct alterations of these areas. Protection of crucial habitat is very important to proper management of the fishery resources.

5. Allow no blocking of stream flow or stream channel redirection that allows dewatering of spawning, rearing, or overwintering habitat used by an anadromous species. This includes ensuring that culverts and other man-made water structures do not freeze up in the winter or back up at high flow. Make every effort to avoid activities that effect habitats utilized by resident species.

Designation of the Toolik Lake RNA

The lands surrounding and adjacent to Toolik Lake in the Utility Corridor are presently serving as valuable research sites for a number of projects of national interest. These research projects focus on various aspects of the tundra biome and have produced, and are continuing to produce, valuable information concerning wildlife habitat on the north slope of Alaska. Results of carefully planned and detailed habitat research in the arctic environment are essential for the design of effective protective stipulatory controls placed on resource development projects. Such research and the resulting stipulations are the foundation of successful multiple use management of natural resources.

It is recommended that 82,000 acres defining the watershed of the Toolik Lake area be designated a Research Natural Area (RNA) consistent with the findings in the BLM *Utility Corridor Resource Management Plan*. Management practices and allowable uses in this ACEC would include the following:

1. Energy transportation would remain the primary function of the corridor lands which make up this Research Natural Area.

2. All authorized actions would be reviewed to ensure that they are not in conflict with on-going research projects in the area.

3. No recreational camping would be permitted within this Research Natural Area.

4. Guiding operations would not be authorized at Toolik Lake.

5. Public use campgrounds would not be developed at Toolik Lake.

6. The sale of mineral materials would be confined to already disturbed sites. New sites would be considered if it is demonstrated that no other economically feasible alternatives are available or if the opening of a new site would be consistent with planned or on-going research interests.

7. No lands within the RNA would be made available for land disposal (state selection, exchange).

8. Evaluations of proposed solid waste sites would fully consider impacts to on-going research activities within the RNA.

To successfully implement these actions and/or restrictions it is recommended that all proposed authorized activities within the RNA be coordinated with the University of Alaska to ensure that no conflicts with on-going research would result. In addition, it is recommended that BLM prepare a detailed Activity Plan to fully address the management of all resources in this RNA with an emphasis on maintaining both the energy transportation function of the corridor and the integrity of on-going research.

Table 4.2
Legal Description of the Recommended Wilderness Area

Towship and Range	Sections	Descriptions
Kateel River Meridian (unsurveyed)		
T 30 N, R 13 E	Secs. 1-2	That portion outside the Gates of the Arctic National Park
	Sec.3	That portion outside the Gates of the Arctic National Park and the Noatak National Preserve
	Sec. 12	That portion outside the Gates of the Arctic National Park and Wilderness.
T 31 N, R 13 E*	Secs. 1-4 inclusive	
	Secs. 5 and 8	That portion outside NPR-A
	Secs. 9 -16 inclusive	
	Sec. 17	That portion outside NPR- A
	Sec. 20	That portion outside the Noatak National Preserve and Wilderness and outside NPR-A
	Secs. 21-26 inclusive	
	Secs. 27-29 and 34	Those portions outside the Noatak Preserve and Wilderness.
	Secs. 35-36 inclusive	
T 30 N, R 14 E	Sec. 2	W1/2W1/2
	Secs. 3-6 inclusive	
	Secs. 7	Those portions outside the Gates of the Arctic National Park andWilderness
	Secs. 8-10 inclusive	
	Sec. 11	W1/2W1/2
	Sec 14	W1/2W1/2
	Sec. 15-17 inclusive	
	Secs. 18-21	Those portions outside the Gates of the Arctic National Park and Wilderness.
	Sec. 22 inclusive	
	Sec. 23	W1/2 W1/2
T 31 N, R 14 E	Sec. 2	W1/2W1/2
	Secs. 3-10 inclusive	
	Sec. 11	W1/2W1/2
	Sec. 14	W1/2W1/2
	Secs 15-22 inclusive	
	Sec. 23	W1/2W1/2
	Sec. 26	W1/2/W1/2
	Sec 27-34 inclusive	
	Sec. 35	W1/2W1/2
T 32 N, R 13 E*	Sec. 32 inclusive	

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* The most easternly tier of Secs. located in these townships may or may not be fully included depending on final survey to determine the southeastern boundary of NPR-A.

Protection Measures for Wildlife and Wildlife Habitat Resources

The protection measures outlined in this report have been formulated for Alaskan arctic values and result from the analysis of available studies and literature review. They are intended to protect crucial habitat and wildlife values within the study area if development occurs. All of the biological lease stipulations listed in Appendix A would apply. The reader is referred to these stipulations as a guide to the standard operating procedures used to protect wildlife and wildlife habitat from development activities. In addition, the following procedures and/or measures are recommended if oil and gas development occurs.

Terrestrial Wildlife

1. Implement protection measures recommended by the Peregrine Falcon Recovery Plan-Alaska Population (U.S. Fish and Wildlife Service 1982).

2. A Surface Development Plan should be prepared as part of an EIS, which would allow the orderly development of oil and gas fields by designing reasonable estimates of the development needs throughout the life of the field, and ensure caribou passage to and from important use areas. A development plan is important due to wildlife concentrations and migration routes through the area.

3. The natural drainage patterns should be identified before, and maintained during the construction of roads, pads, pipelines, and other facilities. Culverts, bridges, and other such drainage structures should be installed where needed to maintain natural drainage patterns.

4. Aircraft used in conjunction with BLM authorized operations and activities should be required to maintain an altitude of 1,000 ft. above ground level (AGL) year-round, except for take-offs and landings, unless doing so would endanger human life or be an unsafe flying practice.

5. Fill or excavation for siting of facilities should be allowed in Class I wetlands (see Appendix C) and upland habitats. No fill or excavation would be allowed within wetland classes II through VIII if reasonable alternatives exist for siting of facilities outside of these areas.

6. Construction of roads, pads and facilities should be accomplished between October 1 and April 30 to the maximum extent possible. Routine maintenance, production and transportation should be allowed year-round.

Aquatic Resources

Recommendations for management and protection of aquatic resources within the study area must center on an initial inventory and systematic monitoring of the resource. Management has little or no options when specific resource data is not available. An initial inventory will establish baseline data, identify crucial habitat, and better inform land managers of resource values and management options. Recommendations to eliminate or mitigate impacts resulting from oil and gas exploration, development, production and transportation and other human uses are as follows:

1. Where possible, restrict exploration and development activities to winter operations. Although winter operations increase the potential for some impacts (e.g., water removal under ice and contamination of overwintering habitat), the chance of overall catastrophic impacts is significantly reduced.

2. Restrict gravel removal to large river channels and to the floodplain within the channel during low water periods and make every effort to maintain existing flow regimes.

Section 5 Consultation and Coordination

Section 5

Consultation and Coordination

The Consultation Process

Throughout the study process, the BLM consulted and coordinated with the State of Alaska, the U.S. secretaries of energy and transportation, the North Slope Borough, Alaskan Native village and regional corporations, the Alaska Land Use Council, and the government of Canada. The consultation process proceeded in three phases.

Phase One

Because this study effort was combined with work on the draft *Utility Corridor Resource Management Plan* (USDOI 1987) and the *CAMA Wilderness Recommendations and Final EIS* (USDOI 1988), the public comment period for the draft plan and the draft wilderness EIS also served for taking public comment on the proposed elements of this report. This was possible because the 1001 study results and recommendations are fully consistent with the findings and recommendations in the management plan and wilderness recommendations. This comment began August 19 and ended November 30 , 1987. Comments were accepted through December 18, 1987.

Phase Two

A draft of this report was issued for simultaneous review by appropriate federal agencies, the secretaries of energy and transportation and the government of Canada during January and February, 1988. This review period also provided an opportunity for BLM staff to meet directly with representatives of these agencies and Canada for briefings on the the study results. Suggestions for changes were considered and, where appropriate, incorporated into the final report.

Phase Three

The final phase consisted of a review of the final form of this report for all those agencies and Canadian representatives reviewing the draft report during the second phase. Comments and suggestions for changes were incorporated, when appropriate, into the final report. This consultation phase took place between April and September of 1988.

Results of Public and Agency Review

The bureau received a total of 97 letters (with 118 signatures) between August 19 and November 30, 1987 commenting on all aspects of the draft *Utility Corridor Resource Management Plan and Wilderness EIS*. Public meetings and formal public hearings were held during this time period in the communities listed in table 5.1.

Of the total written responses there were 53 comments on the wilderness recommendation. A very small minority (1 respondent) either favored the wilderness recommendation as it is presented in this report or felt that there should be less wilderness proposed (2 respondents). The majority of comments expressed the desire for more wilderness designations in the study area (48 respondents) with many preferring the Partial Wilderness Alternative discussed in the draft wilderness EIS [Appendix J of the draft *Utility Corridor Resource Management Plan* (USDOI 1987c)]. Many of these comments indirectly expressed the need to protect wildlife values in the study area through designation of additional wilderness thereby withdrawing large areas from oil and gas leasing and development.

Table 5.1
Public Meeting Attendance

Meeting Place	Date of Meeting	No.Attending
Barrow *	Sept 29	9
Nuiqsut	Sept 30	19
Fairbanks *	Oct. 7	31
Anchorage *	Oct. 9	15
Coldfoot	Oct. 13	29
Bettles/Evansville	Oct. 14	9
Anaktuvuk Pass	Oct. 14	8
Stevens Village	Oct. 15	14

* The sites of fomal wilderness hearings

At the formal wilderness hearing held in Barrow and at the public meeting held in Nuiqsut commentors focused on the potential negative environmental impacts resulting from oil and gas development. Attendees at the meeting held in Anaktuvuk Pass expressed concern for possible negative effects on local subsistence uses of wildlife resources through the designation of wilderness areas. Wilderness designation is often perceived in rural communities as limiting access to hunting or fishing areas.

A small number of attendees at the Fairbanks and Anchorage public meetings and hearings expressed concern for the possible negative environmental effects on adjacent Conservation System Units through the opening of federal lands to oil and gas leasing and development.

Attendees at the other public meetings did not comment on issues related to this report.

Overall, the formal public hearing on the wilderness recommendation produced 10 individual statements. Four individuals voiced their opposition to any wilderness designation, two favored the recommendation in this report, and the remaining five expressed the desire that additional lands be recommended for wilderness designation. Transcripts of the formal testimony is available for review at the Arctic District Office of the BLM, 1150 University Ave., Fairbanks, Alaska, 99709. Copies of these transcripts are also available upon request.

Representatives of BLM met with Department of Energy and Department of Transportation staff during the week of January 18, 1988 to discuss the contents of the first draft of this report. Comments from these agencies have been used in the development of this report.

The Department of Energy expressed concern regarding possible impacts to on-going and future research activities near Toolik Lake, a large lake within the Utility Corridor just north of the Brooks Range. In response to this concern, the proposed *Utility Corridor Resource Management*

Plan (USDOI 1987c) would designate 82,000 acres surrounding Toolik Lake as a Research Natural Area (RNA). This proposed designation is designed to addressed DOE's concerns and to lessen any unnecessary or undue effects on research work as a result of oil and gas development or transportation in the region. This proposed RNA is explained more fully in Section 4 of this report and in the proposed management plan.

Consultation with the Department of Transportation resulted in detailed comments on the draft version of this report. Where appropriate, changes were made for this final version of the report to meet DOT's concerns.

Consultation with the Government of Canada

Consultation with the Government of Canada took place through official government-to-government channels beginning with a request in April, 1988 to review an earlier draft of the report.

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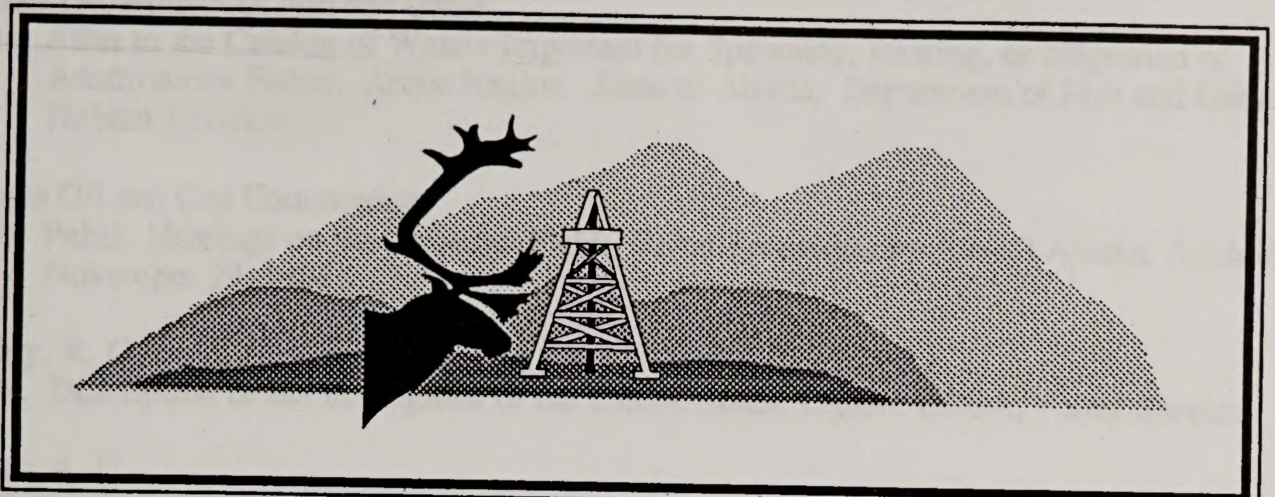

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8. The Permittee may be requested by the Authorized Officer to furnish quarters and transportation for designated field representatives or observers to inspect operations.

Environmental

1. Permittee will conduct an environmental briefing for all employees, contractors, and subcontractors which will cover the stipulations attached to the permit.

2. All operations will be conducted in such a manner as to not cause damage or disturbance to any fish or wildlife and subsistence resources. This includes, but is not limited to, the following:

    a. No seismic vehicle operations within one-half mile of any denning barren ground grizzly (in the upland area) or any denning polar bear (near the sea coast or in the lower reaches of major rivers or estuaries).

    b. No chasing by vehicles or buzzing by aircraft of any wildlife, particularly caribou.

    c. Operators shall prohibit their employees, agents, contractors, subcontractors and their employees, while on duty or living at any camp or mobile camp, from feeding wild animals or birds or from leaving garbage or other potentially edible items which would attract wild animals or birds. Garbage will be kept in covered containers while waiting incineration.

    d. Aircraft shall maintain 1,000 foot altitude (except for take off and landings) over designated caribou concentration areas (i.e., winter and summer ranges, insect relief areas, etc.) during the specific time period designated unless doing so would endanger human life or be an unsafe flying practice.

3. All operations shall be conducted with due regard for good resource management and in such a manner as not to block any stream, or drainage system, or change the character or course of a stream, or cause the pollution or siltation of any stream or lake.

4. All activities shall be conducted so as to avoid or minimize disturbance to vegetation.

5. Seismic operations are to begin only after the seasonal frost in the tundra and underlying mineral soils has reached a depth of 12 inches; the average snow cover a depth of 6 inches.

6. Seismic operations will cease when the spring melt of snow begins; approximately May 5 in the foothill areas exceeding 300 feet in elevation; approximately 15 May in the northern coastal areas. The cut-off date will be determined by the Authorized Officer.

7. To prevent surface disturbance, tracked vehicles will not execute tight turns by locking one track.

8. Cultural Resources

    a. The Antiquities Act of June 8, 1906, (34 Stat. 225; 16 U.S.C. 431-433) prohibits the appropriation, excavation, injury or destruction of any historic or prehistoric ruin or monument, or any other object of antiquity, situated on lands owned or controlled by the United States. No historic site, archeological site or camp, either active or abandoned, shall be disturbed in any manner nor shall any item be removed. Should such sites be discovered during the course of field operations, the Authorized Officer will be promptly notified.

    b. Operations must not impede rural residents from pursuing their traditional subsistence activities (ANILCA, PL 96-487).

c. The dates on which the actual exploration was conducted.

d. A statement that all terms and conditions have been complied with or that corrective measures shall be taken to rehabilitate the lands or other resources.

15. All fuel containers must be marked with the operator's name, date purchased and contents. No fuel storage or refueling of equipment shall be allowed within the flood plain of a river or lake.

16. All refuse, fuel, food tins, human wastes and debris must be recovered from the public lands to approved collection sites. Garbage and human wastes may not be buried.

17. The foregoing provisions do not relieve the contractor or his subcontractor of any responsibilities or provisions required by any applicable laws or regulations.

Winter — Seismic Stipulations

In the performance of any operations under a Notice of Intent or Permit for geophysical exploration in the Arctic District Area, the applicant known here as the "Permittee" shall comply with the following stipulations:

General

1. The BLM Arctic District Manager or his delegate is the Authorized Officer (AO) for this permitted activity.

2. Communication regarding sections 1 through 5 of this attachment shall be addressed to:

Arctic District Manager
1150 University Avenue
Fairbanks, Alaska 99709
(907) 474-2301

3. The Authorized Officer or his designated Field Representative may issue temporary suspension orders for any activity if operations are in non-compliance with these stipulations.

4. Requests to resume suspended activities shall be made directly to the Authorized Officer when the non-compliance has been corrected.

5. In matters of disagreement between the Authorized Officer and the Permittee, appeals may be made directly to the BLM State Director.

6. This permit is not valid for seismic exploration until the Authorized Officer receives detailed descriptions and plats of proposed shot lines (scale at least 1:250,000) and principal contacts, including field representatives, are identified by both parties.

7. As a condition of this permit, the Government of the United States of America reserves access to all geophysical data, processed geophysical information, reprocessed geophysical information, and interpreted geophysical information collected by the Permittee pursuant to this permit. The Division of Minerals, Chief Branch of Mineral Assessment, shall act on the Government's behalf in accordance with Section 6.

Operational

1. Exploration activities will employ low ground pressure vehicles of the rolligon, ARDCO, Trackmaster, Nodwell or of a smiliar type. The limited use of tractors, equipped with wide tracks or "shoes" will be allowed to pull the camp and fuel trailers. Any exceptions to this stipulation will require the written approval of the Authorized Officer.

2. Crossing of waterway courses shall be made using a low angle approach in order not to disrupt the naturally occurring stream or lake banks.

    a. Alteration of the banks of a watercourse is prohibited.

    b. If snow ramps or snow bridges are utilized at watercourse crossings for bank protection,shall be substantially free of soil and/or debris. Snow bridges shall be removed or breached immediately after use or before spring breakup.

    c. Equipment shall not enter open-water areas of watercourses.

    d. To avoid additional freezedown of deep water pools harboring overwintering fish, watercourses shall be crossed at shallow riffle areas from point bar to point bar whenever possible.

    Compaction or removal of the insulating snow cover from the deep-water pool areas of rivers known to harbor overwintering fish shall be avoided.

3. No bulldozing of tundra areas, trails, or seismic lines will be allowed. This stipulation, however, does not prohibit the clearing of drifted snow along a trail or seismic line or in a camp, to the extent that the tundra mat is not disturbed. Also, it does not prohibit the clearing of snow on a lake or river ice surface in order to prepare an aircraft runway.

4. Camps will be situated on gravel bars, sand, or other durable lands. Where leveling of trailers or modules is required and the surface has a vegetative mat, leveling will be accomplished with blocking rather than leveling with a bulldozer.

5. Camps will not be located on frozen lakes or on river ice. The location of camps on river sand or gravel bars is allowed and, where feasible, encouraged.

6. The contractor shall protect all survey monumments, witness corners and reference monuments against destruction, obliteration or damage. He shall, at his expense, re-establish damaged, destroyed or obliterated monuments and corners in their original position. A record of the re-establishment shall be submitted to the Authorized Officer.

7. Water Quality

    a. All parties shall comply with applicable "Water Quality Standards" of the State of Alaska as approved by the Environmental Protection Agency.

        i) Waste water shall receive treatment conforming to federal requirements for secondary treatment if Arctic-tested package treatment facilities are used.

        ii) If chemical recirculating sewage facilities are employed, they shall be kept separate from the gray wash and kitchen waste water. Gray wash water and kitchen waste water may be filtered to remove the solids and the liquid discharged to the land surface. All solids and sludges shall be incinerated.

8. Air Quality

a. Emissions from equipment and burning materials shall be held within Federal and State air quality standards.

9. Solid Waste

a. A solid waste management plan must be approved by Alaska Department of Environmental Conservation (D.E.C.) prior to initiating field work (Ref. PL 94-580). If approved by the D.E.C., all combustible solid waste, including cartons and used lubricating oils will be incinerated or returned to the base of operations for approved disposal. All non-combustible solid waste, including fuel drums, will be returned to the base of operations for approved disposal. There will be no burial of garbage or the dozing up of any area for the burial of anything. Disposal of any material by burial is prohibited.

b. Seismic lines shall be left clean of all foreign debris. This shall include, but is not limited to, wire, lathe, pin flags and reflectors.

10. Fuel Handling and Storage

a. A hazardous liquid spill control and contingency plan for each geophysical party will be submitted to the Authorized Officer prior to beginning operations (40 CFR 112).

b. Oil spills will be incinerated in approved receptacles but not on lake or river ice.

c. Although fuels may be off-loaded from aircraft on the ice, there will be no storage of fuels on lake or river ice, even on a temporary basis.

d. All fuel spills will be cleaned up immediately, taking precedence over all other matters, except the health and safety of personnel. Spills will be cleaned up utilizing absorbent pads or other approved methods. As soon as possible, but not later than 24 hours after the incident, notice of any such discharge as defined in Alaska Statute Title 18, Chapter 75, Article 2, will be given to:

i) The Authorized Officer in Fairbanks.

ii) Such other Federal and State officials as are required by law to be given such notice.

e. Ample oil spill cleanup materials (absorbents) will be carried by each seismic crew and stored at all fueling points and vehicle maintenance areas.

f. Storage and Handling

i) State and Federal safety standards for fuel handling will be followed.

ii) Drip basins or absorbent diapers will be placed under all non dry-disconnect-type fuel line couplings.

11. All fuel containers used, including barrels and propane tanks, must be marked with Permittee's name, fuel type, and purchase date (e.g., GSI, Hydraulic Fluid, 1983).

12. Field parties will keep daily records of seismic lines completed, fuel haul and camp move routes and campsites utilized.

13. The foregoing provisions do not relieve the contractor or his subcontractors or any responsibilities or provisions required by any applicable laws or regulations.

14. A copy of these stipulations shall be posted in a conspicuous place in each camp site established for the purpose of geophysical exploration with NPR-A.

15. More than one Permittee may be approved to conduct geophysical activities in the same area within NPR-A or other public lands. In such a case, it is incumbent upon the Permittees to resolve conflicts in their activities. The Authorized Officer will curtail all activities within certain areas if resolution cannot be achieved by the Permittees.

Notice of Completion

1.A final summary report shall be submitted to the Authorized Officer within 30 days of completion or cessation of operations. This report shall include:

a. Program completion date.

b. Field effort in crew weeks.

c. Line miles of surveys completed.

d. Summary of incidents or accidents (including reported oil spills).

e. Location map on 1:250,000 scale showing location of lines actually shot, campsites utilized, and routes used for fuel hauls and camp moves.

2. The Authorized Officer shall receive copies of Permittee's notification to the BLM Alaska Chief, Division of Minerals, in order to demonstrate satisfaction of permit stipulations 1.6 and Permit Attachment 1.

Bonding

Permittee must file with the Authorized Officer evidence of bonding. A rider to either a $50,000 nation-wide or $25,000 state-wide bond shall pertain to the NPR-A and Arctic Resource Area seismic activities. This bonding requirement shall apply separately to each seismic train.

Geophysical Data

1. Inspection, selection, and submission of geophysical information and data:

a. The Permittee shall immediately notify the BLM Alaska Chief, Division of Mineral Assessment (CDM) , in writing, of the acquisition, processing, reprocessing, or interpretation of any geophysical information or data collected under this permit.

b. All such data and information collected by the Permittee shall be available for inspection by the CDM. At any time within five years after receiving a notice of the acquisition, processing, reprocessing, or interpretation of any geophysical information and data, the CDM may select all or part of the geophysical information.

c. If the CDM decides to keep all or a portion of the geophysical information and data, he shall notify the Permittee in writing of his decision.

d. In the event that geophysical data, processed geophysical information, reprocessed geophysical information, or interpreted geophysical information is transferred from the Permittee to a third party, or from a third party to other parties, the transferor shall, in writing, so notify the CDM and shall require the receiving third party, in writing, to abide by the obligations of the Permittee as specified in this section as a condition of the transfer of information or data.

e. Each submission of geophysical data, processed geophysical information, reprocessed geophysical information, and interpreted geophysical information, shall contain, unless otherwise specified by the CDM, the following:

i) An accurate and complete record of each geophysical survey conducted under the permit, including digital location data and final location maps of all survey stations.

ii) All seismic data developed under a permit shall be in a format and of a quality suitable for processing.

iii) Processed geophysical information derived from seismic data with extraneous signals and interference removed, shall be presented in a format and of a quality suitable for interpretive evaluation, reflecting state-of-the-art processing techniques.

iv) Other geophysical data, processed geophysical information, reprocessed geophysical information, and interpreted geophysical information obtained from, but not limited to, Vibroseis logs, gravity and magnetic surveys, and special studies such as refraction and velocity surveys

2. Reimbursement to Permittees:

a. After the delivery of geophysical data, processed geophysical information, and reprocessed geophysical information selected by the CDM, and upon receipt of a request for reimbursement and a determination that the requested reimbursement is proper, the Permittee or third party shall be reimbursed for the cost of reproducing the selected information and data at the Permittee's or third party's lowest rate or at the lowest commercial rate established in the area, whichever is less.

b. The Permittee shall not be reimbursed for the cost of any interpretations submitted.

3. Disclosure of information and data to the public:

a. The CDM may only make information and data submitted by a Permittee available in accordance with the requirements of and subject to the limitations of the Freedom of Information Act (5 USC 552) and the implementing regulations (43 CFR Part 2).

b. No information or data, determined by the CDM to be exempt from public disclosure, shall be provided to any affected State, or be made available to the executive of any affected local government or to the public, unless the Permittee and all persons to whom such Permittee has sold the information or data under promise of confidentiality agree to such an action.

4. Disclosure to independent contractors

a. The CDM reserves the right to disclose any information or data acquired from a Permittee to an independent contractor or agent for the purpose of reproducing, processing, reprocessing or interpreting such information or data. The CDM shall notify the Permittee who provided the

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225